6 m «Relais»-Antennen

Einfache Antennen zur Teilnahme am Testbetrieb des 6m Relais HB9AG

Kurzvortrag am HB9AG-Stamm vom 03.03.2023

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AE02

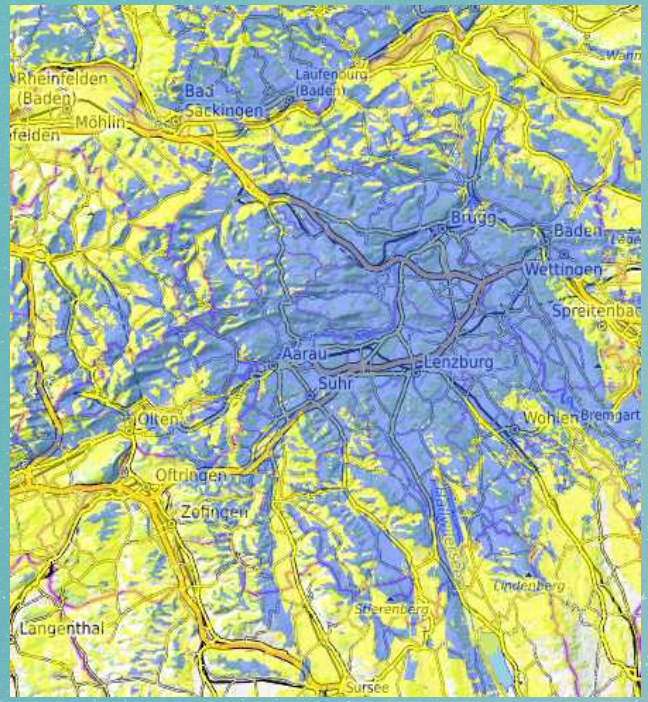
Inhalt

- Einzugsgebiet
- Anforderungen an die Antenne
- Antennenformen und ihre Eigenschaften
- Bauanleitung/Beschaffung
- Links (Berechnung, Quellen etc.)

Technische Daten 6m Relais

- f_{RX}: 51.930 MHz
- f_{TX}: 51.330 MHz
- f_{ctcss}: 77 Hz
- Antennen: omni-direktional, ~0 dBd, vertikale Polarisation
- Power: 10 W

Abdeckung Testbetrieb

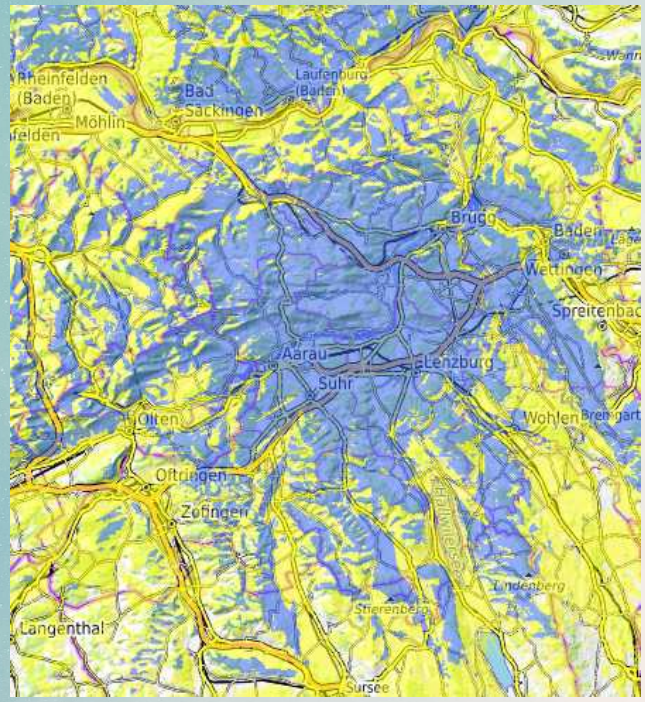


Pwr.: 10 W
Ant. Gain: 0 dBd

> 1 µV

> 10 µV

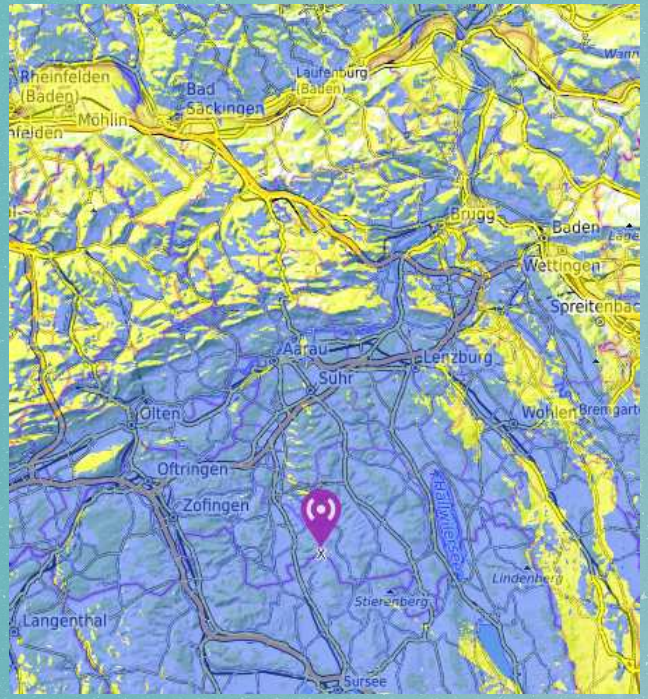
[1]



TX in Möriken

RX in Rupperswil

Abdeckung def. Betrieb



TX auf Nützweid

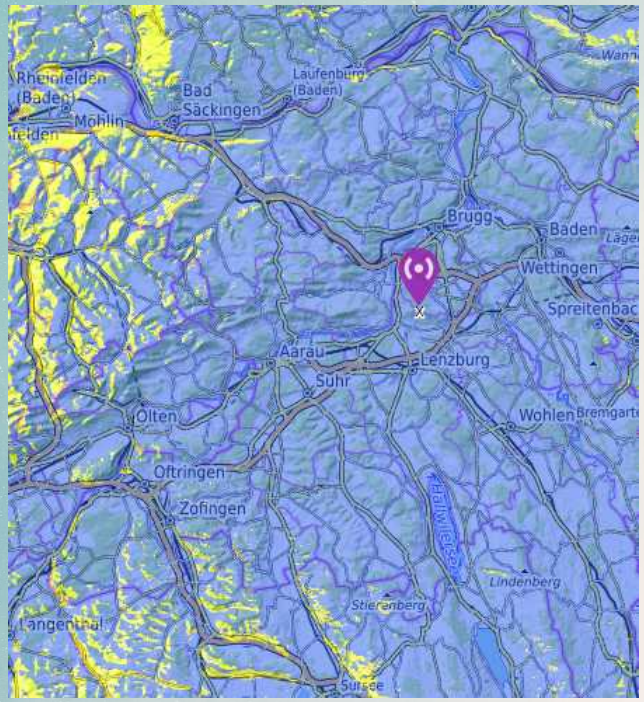
Pwr.: 10 W
Ant. Gain: 0 dBd

> 1 µV

> 10 µV

Annahme:
gleiches Rig wie
bei Testbetrieb

[1]



RX auf Chestenberg

Anforderungen an die Antenne

- Vertikale Polarisation
- Gewin: ≥ 0 dBd im «Kerngebiet»
  (Aarau – Frick – Brugg - Lenzburg)
- RL: > 20 dB für TX-Frequenz
- Einfache Beschaffung/Herstellung

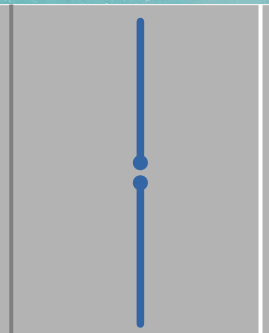
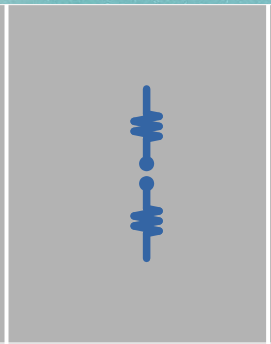
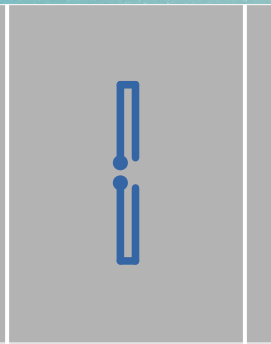
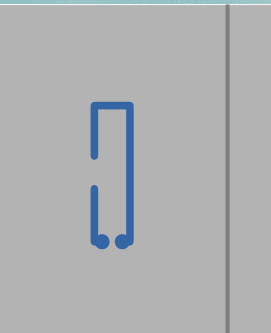
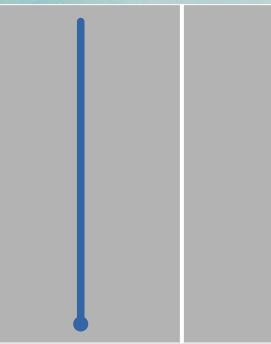
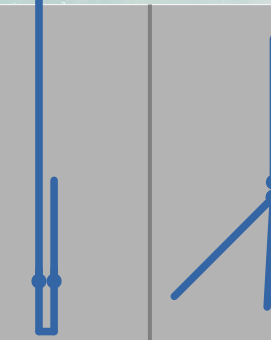
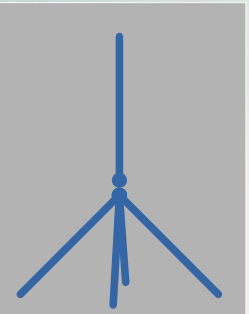
Antennen-Typen: Übersicht

- Omnidirektional
- λ/2 Dipol (mid-/end-fed, loaded)
- Ground plane
- (Collinear)

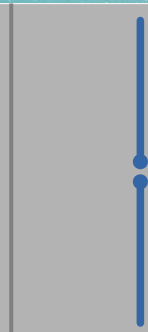
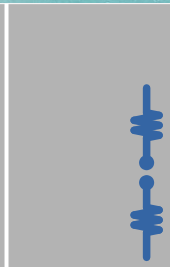
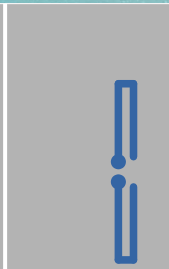
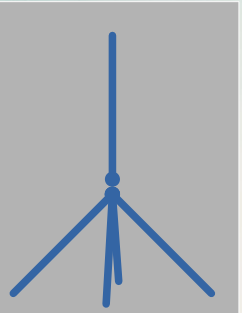
Richtantennen

- Loop (Quad, Delta, Oblong, Hentenna)
- Small Transmission Loop (STM)
- Yagi

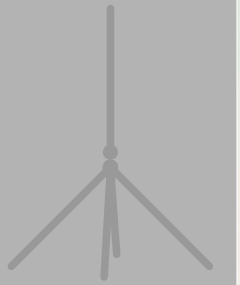
Antennen-Typen: / Eigenschaften

Shape							
Type	L/2 dipole, center-fed	Dipole, center-fed, coil-loaded	Dipole, linear-loaded	C-pole	L/2 dipole, end-fed	J-pole	Ground plane
Impedance/ return loss	74 Ω / 14 dB	46 Ω / 28 dB	27 Ω / 11 dB	52 Ω / 32 dB	A few kΩ/ 50 Ω	49 Ω / 37 dB	53 Ω / 31 dB
Gain/elev. f-f 0.25 λ 1 λ	0 dBd / 0° -0.6 dBd / 14 ° +1.3 dBd / 9 °	-0.2 dBd / 0° -0.7 dBd / 15° +1.0 dBd / 9°	-0.4 dBd / 0° -0.9 dBd / 15° +1.0 dBd / 9°	See center-fed dipole	See center-fed dipole	-0.3 dBd / 13° -0.1 dBd / 12° +1.6 dBd / 8°	-0.3 dBd / 0° -1.1 dBd / 18° +0.6 dBd / 10°
Matching network	MWS	MWS [2]	DK7ZB balun 37 Ω [3], [4]	MWS [5], [6],	Pi network, Radial, MWS [7], [8]	MWS ? [9]	None [10]

Antennen-Typen: Vor-/Nachteile

Shape							
Type	L/2 dipole, center-fed	Dipole, center-fed, coil-loaded	Dipole, linear-loaded	C-pole	L/2 dipole, end-fed	J-pole	Ground plane
+	Kleiner Bauaufwand, Einfache Abstimmung	Abstimmung, L < 2m	L < 2m	Gute Anpassung, kompakt			Gute Anpassung,
—	Mässige Anpassung	Spule wickeln	Abstimmung Balun		Anpass-Netzwerk	Mit L/4-stub: sehr lang	Voluminös, Hoher Bauaufwand

Antennen-Typen: Auswahl

Shape							
Type	**L/2 dipole, center-fed**	Dipole, center-fed, coil-loaded	Dipole, linear-loaded	**C-pole**	L/2 dipole, end-fed	J-pole	Ground plane
+	**Kleiner Bauaufwand, Einfache Abstimmung**	Abstimmung, L < 2m	L < 2m	**Gute Anpassung, kompakt**			Gute Anpassung,
—	**Mässige Anpassung**	Spule wickeln	Abstimmung Balun		Anpass-Netzwerk	Mit L/4-stub: sehr lang	Voluminös, grosser Bauaufwand

Realisierte Antennen: λ/2 Dipol

Stückliste [11], [12]

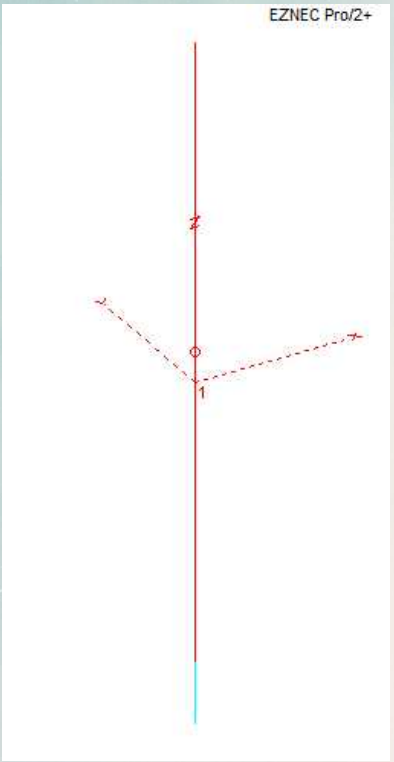
- 3 m Installationsdraht, 1.5 mm^2
- 3 m Installationsrohr KRH M25*
- 1 Verlängerungsstück M25
- 2 Stopfen M25
- PMMA- (Acrylglas) Spreizer, 15 x 15 x 1.5 mm
- 1 m Koaxialkabel RG 174 (Mantelwellensperre)
- 1 HT-Rohr DN50, Länge 35 mm (Mantelwellensperre)
- 1 Nassabzweigdose 75 x 75 x 42 mm
- 1 N-Flanschbuchse UG-38 TG
- Diverse Schrauben, Muttern, U-Scheiben, Kabelbinder, Abdichtmaterial, Klebstoff etc.

* für besseren Wetterschutz (UV-Beständigkeit) GFK-Rohre verwenden

Dimensionen

(Simulation/Prototype)

1: 2858/xxx mm



Realisierte Antennen: C-pole

Stückliste [11], [12]

- 3.5 m Installationsdraht, 1.5 mm2
- 3 m Installationsrohr KRH M25 (Spreizer, Mast)*
- 1 T-Stück M25
- PMMA- (Acrylglas) Platte, 120 x 120 x 1.5 mm (Kreuzschelle)
- 1 m Koaxialkabel RG 174 (Mantelwellensperre)
- 1 HT-Rohr DN50, Länge 35 mm (Mantelwellensperre)
- 1 Nassabzweigdose 75 x 75 x 42 mm
- 1 N-Flanschbuchse UG-38 TG
- Diverse Schrauben, Muttern, U-Scheiben, Kabelbinder, Abdichtmaterial, Klebstoff etc.

* für besseren Wetterschutz (UV-Beständigkeit) GFK-Rohre verwenden

Dimensionen

(Simulation/Prototype)

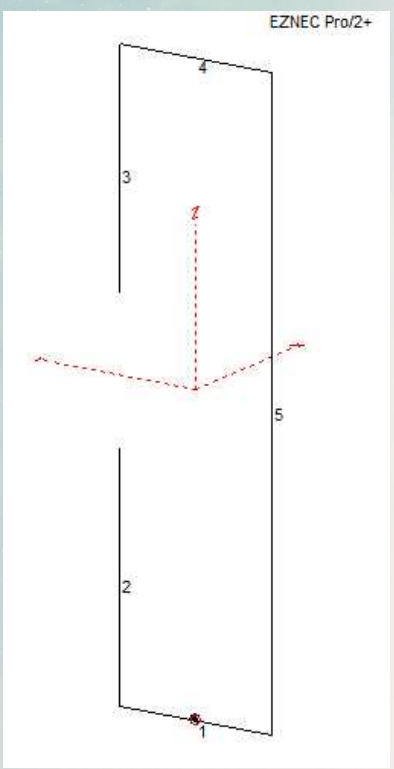
1: 350/350 mm

2: 520/590 mm

3: 500/540 mm

4: 350/350 mm

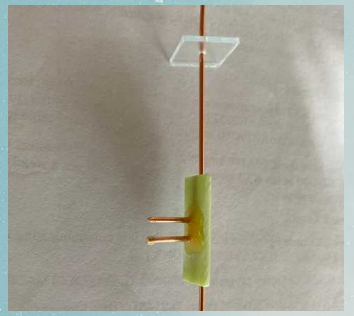
5: 1330/1320 mm



Konstruktions-Detail

- Mantelwellen-Sperre
  - 6 Wdg. RG-174 auf 50mm Rohr

- Isolatoren
  - Zentrierung im KRH-Rohr: PMMA-Quadrate, mit Heisskleber gesichert
  - Mittenisolator aus FR4, mit Araldit geklebt



Quellen/Links

[1]	Funkabdeckung «Radio Mobile Online»	https://www.ve2dbe.com/rmonline_s.asp
[2]	Coil loaded dipole, calculator	https://k7mem.com/Ant_Short_Dipole.html
[3]	»Linear loaded dipole» by K7MEM	https://k7mem.com/Ant_Linear_Loaded.html
[4]	»The DK7ZB-Match...» by DK7ZB	https://www.qsl.net/dk7zb/dk7zb-match.htm
[5]	»The C-pole», QST April 2004	http://dl2lto.de/dld/HB_Cpole_KF2YN.pdf
[6]	»The C-Pole-Antenna» by DK7ZB	https://www.qsl.net/dk7zb/Vertikal/c-pole.htm
[7]	»EZNEC Antenna Software by W7EL»	https://www.eznec.com/
	EZNEC v. 7.0 User Manual «End Fed Antennas	
[8]	»50-Mhz-Lambda/2-Vertical» by DK7ZB	https://www.qsl.net/dk7zb/6m/Vertical.htm
[9]	»J-Pole antennas» by DK7ZB	https://www.qsl.net/dk7zb/J_Pole/wiremanjpole.htm
[10]	»1/4 Wave Antenna Calculator» by M0UKD	https://m0ukd.com/2017/06/14-wave-antenna-calculator/
[11]	Baumarkt «Bauhaus», Oftringen»	https://www.bauhaus.ch/de/
[12]	Suter Kunststoffe	https://www.swiss-composite.ch/

Wrap up

Fragen?

Merci!