



Coming next:

*Wireless antennas for
beginners*



In other rooms:

*Logbook of the World (Sussex Suite)
S02R contest operation (Stable Suite)*





Wires for your wireless: Simple wire antennas for beginners



m0blf
dominic smith

Why am I here?



*Yagis at G6UW / M4A (CQWW SSB 2003)
Photograph by Dominic Smith, M0BLF*



*20m Wire Dipole at GM6UW/P (Monach Islands, September 2004)
Still from video by Dominic Smith, M0BLF*

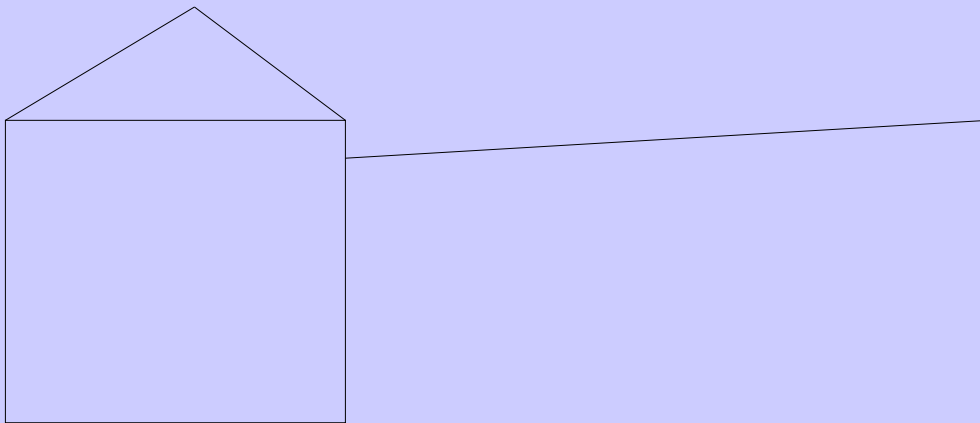
Types of Wire Antenna

- Long Wire
- Beverage
- Dipoles
- Wire beams
- Verticals
- Loops
- G5RV



The Long Wire (1)

- 'Does what it says on the tin'
- How long? (66 foot a good compromise?)



The Long Wire (2)

- Earth connection and ATU needed
- Loses power in ATU
- Not optimal performer
- EMC issues: If fed near house, you could radiate a lot of RF into the house!

The Beverage Antenna

- Great for reception on lower HF bands (160, 80m)
- Hopeless for transmitting!
- Over a wavelength long, in as straight a line as possible
- Mounted on insulated posts near ground level
- Highly directional
- Use steel galvanised (electric fence) wire



Beverage antenna at DX Tuners, Hylteberga, Sweden

Source: http://www.javoradio.com/servlet/IBMainServlet?ib_page=91&parent_id=27&iw_language=en

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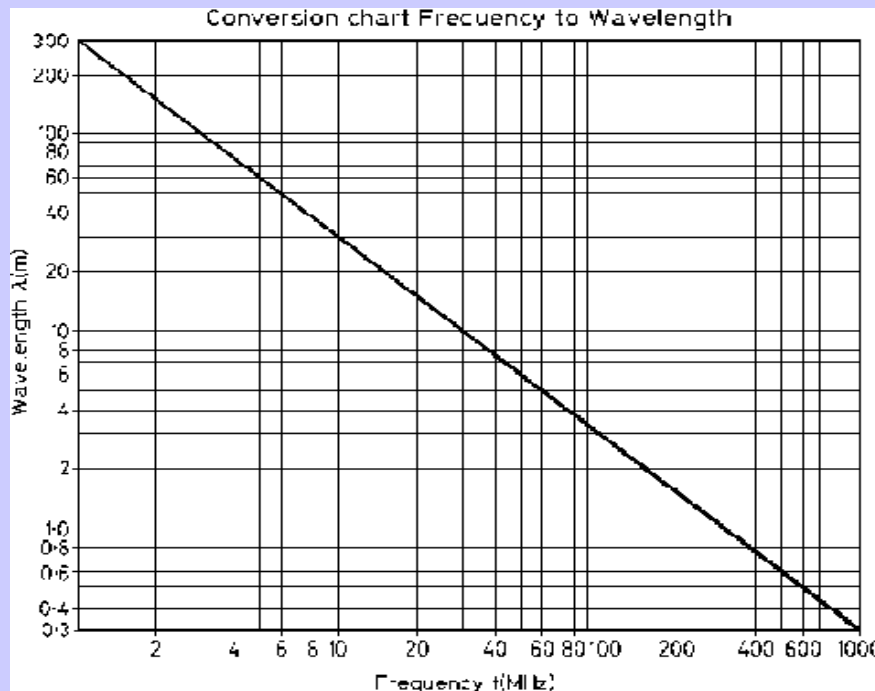
Dipole Theory (1)

- Good performers - no ATU needed, no power loss.
- 1 or 2 supports



Dipole Theory (2)

- One per band: length relates to wavelength



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Wavelength (λ) = speed
of light \div frequency

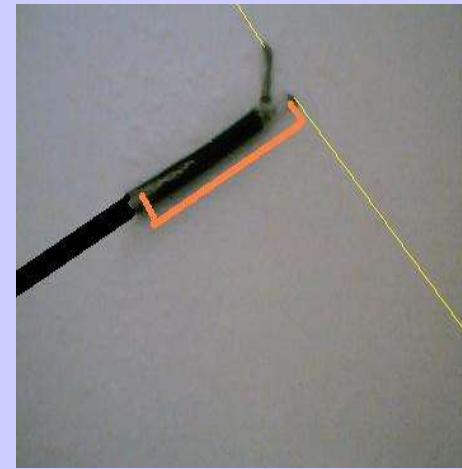
so $300 \div$ frequency in
MHz = wavelength in
meters

Dipole Theory (3)

Frequency	(λ)	(m)	(ft)	
1.8	167	41.67	136.71	• Frequency (MHz)
3.5	86	21.43	70.31	• λ – Wavelength to nearest whole metre
7.0	43	10.71	35.14	• m/ft – Length of dipole leg
10.1	30	7.43	25.38	
14.0	21	5.36	17.59	These are only theoretical measurements. In practice the capacitance at the end of the wires will mean that the legs will probably need to be slightly shorter than shown here.
18.1	17	4.14	13.58	
21.0	14	3.57	11.71	
24.9	12	3.01	9.88	
28.0	11	2.68	8.79	
50.0	6	1.50	4.92	
145.0	2	0.52	1.71	
430.0	0.7	0.17	0.56	

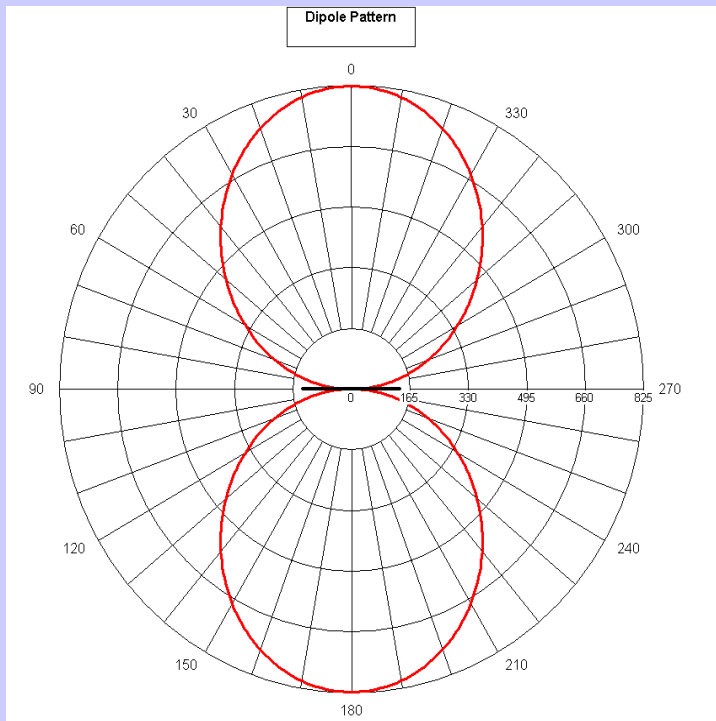
Dipole Theory (4)

- Very simple (but should have a balun)
- A balun can be simply three or more (depending on frequency) tight windings on a small ferrite core, or may be purchased commercially
- Another type of balun is a piece of wire $\frac{1}{4} \lambda$ long, connecting the inner conductor at the feedpoint to the braid at $\frac{1}{4} \lambda$. But only works at one frequency, 'velocity factor' issue and problems resealing the coax where you've cut it.



Dipole Theory (5)

- Half-wave dipole polar plot.



- Inverted-Vee almost omnidirectional

Dipole Theory (6)

- Despite the fact that dipoles are really single-band antennas, they will work on odd multiples of the frequency (3x, 5x etc.)
- Crucially for radio amateurs, this means a 40m dipole (7MHz) will work on 15m (21MHz)
- (At 3x the halfwave frequency, the centre impedance is approximately 90Ω)

Dipole Theory (7)

- Horizontal dipoles over conductive ground will only radiate at low angles if very high.
- Vertical dipoles over conductive ground will radiate at low angles even if very low.
- (a conductive ground shorts out the signal if the electric field is parallel to the ground)

Building a Dipole (1)

- Cut a bit too long and then trim (or fold back or roll up).
[Calculate %age change in resonance needed and apply to length]

- You are building a dipole to be resonant on 14.0MHz. You find that its minimum SWR is on 13.8MHz.

At present, each leg on the dipole is 5.2m long:

$13.8 \div 14 \approx 0.986$, so 13.8MHz is about 98.6% of 14MHz.

You need to cut each leg to be 98.6% of its current length, so:

$$5.2 \times 0.986 \approx 5.127$$

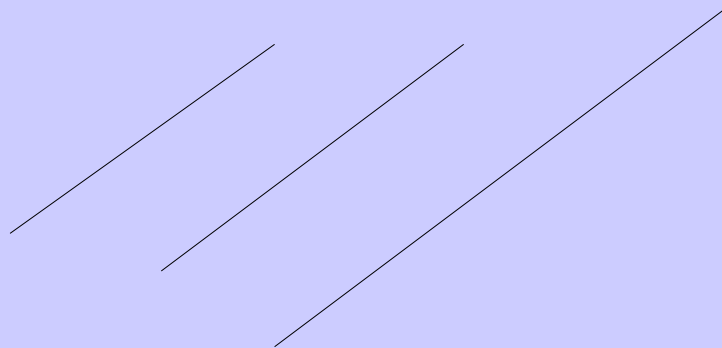
means you need to cut each leg to approximately 5.127m long, so remove 7.3cms from each.

Building a Dipole (2)

- Use folded dipole to multiply impedance by factor of 4 (could be useful if very low height reduces impedance or if close to parasitic elements)
- You could have several dipoles for different bands, fed from the same feeder with a switching system
- Or you can suspend several dipoles from a common centre (but interaction will make tuning difficult)

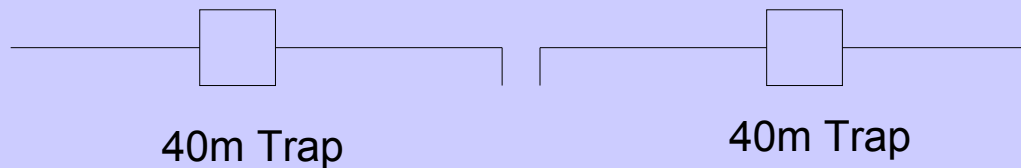
Wire beams

- Just like at VHF a dipole can have a number of directors and a reflector to form a beam (yagi)
- At HF a long boom might be impractical, but a number of wires running parallel will have the same directional effect.



Trap Dipoles (1)

- Although dipoles are single-band antennas, by adding traps we can make them multiband.
- In the diagram below, a wave at 14MHz will only 'see' as far as the traps, but a 7MHz wave will see through them.
- Trap dipoles are sometimes known as W3DZZ Antennas



Trap Dipoles (2)

- Traps are available commercially or are very easy to make
- The turns of the coax and the internal capacitance of the trap create a tuned circuit.
- See <http://users.tellurian.com/jdegood/coaxtrap/>



Verticals

- Can make a quarter wave ground plane by suspending wire from a tree or taping to a fibreglass pole (excess wire at top can be led off horizontally)
- Need good radials/ground plane
- Radials must be resonant if elevated above ground
- Conveniently fed with co-ax at ground level



Loops (1)

- Delta loop is traditional - based on single mast/tree or two masts/trees.
- Form triangle with roughly equal sides.
- Feed at centre of horizontal section for horizontal polarisation or on diagonal side.
- Can have parasitic loops to make fixed beam
- Could also be a square

Loops (2)

- Total length of a delta-loop should be about λ
- Works best at right-angles to the plane of the loop
- Key point is a low angle of radiation

Loops (3)

- Impedance a bit $> 50\Omega$ so may need matching
- Can do this by feeding with a $\frac{1}{4}\lambda$ length of 75Ω coax, then three turns around a ferrite core
- Continue the rest of the feeder with 50Ω coax as normal

G5RV

Like Marmite – You love them or you hate them!

- In theory, a multiband antenna for 3.5 – 28MHz
- Acts as a $1\frac{1}{2} \lambda$ centre-fed antenna on 14MHz
- On other bands (including WARC), it acts as various types of long-wire
- Two radiating parts in a 'T' shape: a wire 'top section' and twin feeder – don't coil the twin feeder on the ground or feed with coax!
- Has a half-size variant for smaller gardens 7 – 28MHz
- G5RV claimed that with a counterpoise and good earth and ATU, both will work on 1.8 MHz too.
- See description in RadCom July 1984

COMPROMISE!

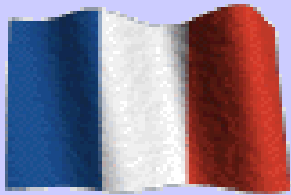
Wires for your wireless

Presentation by Dominic Smith M0BLF, with
assistance from Martin Atherton G3ZAY

This presentation will be available
online to download from:

<http://www.domsmith.co.uk/wireants/>

Email: m0blf@domsmith.co.uk



Coming next:

*Simple QSOs in foreign
languages*

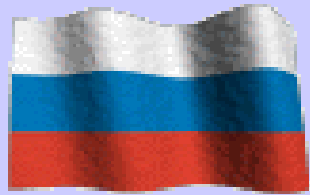
- Martyn G3RFX



In other rooms:

T33C Banaba Island (Sussex Suite)

Spectrum Forum (Stable Suite)



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