

HF Antennas for Small Gardens

- Generally also need to be unobtrusive – but not necessarily 'stealth'
- Most good solutions are wire types
- Most good solutions involve some compromise*
- Beams don't usually feature!
- Usually need to be multi-band

*not just technically but also with the xyl!

How many feet (or metres) have you got?...and other questions

- What shape is your garden
 - Long and thin rectangle (ish)
 - Square (ish)
- Do you have an 80 ft linear run or more?
- Do you want to operate 10m (or 6m) to 80m with a single antenna?
- Do you have close neighbours?

Multiband options

- 80ft or less/no near neighbours:
 - Vertical only with or without radials or loading
 - Inverted 'L' or a 'T'
 - Loaded or bent doublet
 - Zepp or derivative
 - G7FEK
- 80ft or less/near neighbours:
 - Inverted 'L' or 'T'
 - Loaded or bent doublet
 - Zepp or derivative
 - G7FEK
- 105-130ft -not really a small garden!
 - Short doublet for 80m
 - Inverted 'L' or 'T'
 - G5RV
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- Doublets less than 90ft WILL be relatively poor
 - Verticals cause more TVI than most
- $\frac{1}{4}$ wave 'L' for 80m is approx 60ft
 - G7FEK is 46ft long and 24ft high
- Any doublet longer than 90ft can be made to work reasonably – 105ft and 120ft are best
 - G5RV - 105ft

What is full size – and how close do we have to be?

- What is full size on 80m – $\frac{1}{4}$ wave 66ft,
- $\frac{1}{2}$ wave 133ft – other bands $\frac{1}{2}$ wave multiples not matched by ATU/Coupler (v.high Z)
- Forget miracle antennas – they cannot work at all well – they just don't have the aerial aperture for it!
- Loading coils and capacitance devices have losses (capacitance least) but so do ATUs/Couplers
- Short antennas are grossly inefficient under 50-60% of full size

Looks like 40-80ft horizontal then!

- Or a big vertical if you don't have close neighbours! (ZeroFive 60ft! GAP Titan DX 25ft)
- Since most people with small gardens have close neighbours -let's look at the two best options. (opinions may differ!)
- A 60ft inverted L with antenna coupler (auto tuner at the base of the antenna – NOT in the shack) Bigger if possible (80ft also works OK)
- The G7FEK – 46ft long 24ft high

Inverted L

- Omni Directional radiation and conveniently end-fed
- As high as you can get it, but no fixed figure
- Has good DX from the vertical portion
- Has good NVIS from the horizontal portion
- You can bend the hot end to fit into gardens less than 60ft – but keep clear of the ground (people) and anything it can couple with (like phone lines!)
- Why 60ft? (or 80ft)

10-80m all-band forbidden lengths for ATUs/Couplers

10m	16'6"	33'	49'6"	66'	82'6"
13m	18'9"	37'6"	56'3"	75'	93'9"
15m	22'2"	44'4"	66'6"	88'8"	110'10"
17m	25'10"	51'8"	77'6"	103'4"	-
20m	33'6"	67'	100'6"	-	-
30m	46'3"	92'6"	-	-	-
40m	66'5"	132'10"	-	-	-
80m	133'9"	-	-	-	-

60ft neatly fits in!

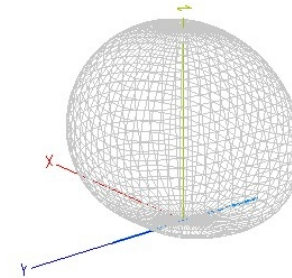
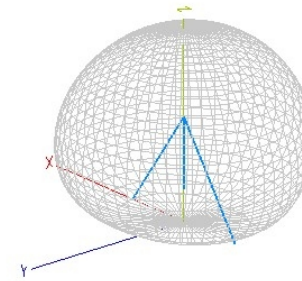
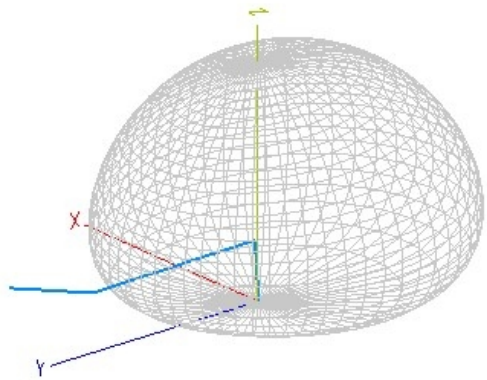
- Also – it is within 10% of quarter wave resonance on 80m – works on all bands
- Other shorter values can be found but 80m efficiency will suffer
- It's quarter wave thus it needs a good RF ground
- Counterpoise radials OK
- Just under surface radials OK (mine are pushed down in between the patio slabs)

How many radials

- There is a law of diminishing returns – most agree after 4 or 6 there is little payback – I have 6, mixed: 2 counterpoise, 4 shallow
- How long? Doesn't matter as long as they are over 30ft. Tests show that the capacitance to earth swamps any resonance requirements by this length.
- Would a short, loaded 60ft dipole be better?

Modelling of my inverted L

comparing with Inv V and Dipole
(loaded 60ft of wire @ 20ft for 80m)



Experimental results

-73dBm	50 microvolts	S9
-80dBm	15 to 23 microvolts	S7/S8

Top row: Inverted L, 60ft, CG3000
aerial coupler

Bottom row: Inverted V, 60ft,
resonated with loading coils (80
turns) 66% out from centre

These are figs derived from SDR on
line receivers in the Netherlands and
Poland. Figures derived from actual
QSOs show little or no difference out
to about 900 miles on 80 m. After
about 1000 miles the Inverted V
signal declines rapidly being barely
received by 1500 miles. (typically in
average condx)

The inverted L does not show this
characteristic and is a better DX
antenna.

Confirms modelling re: low angle
radiation

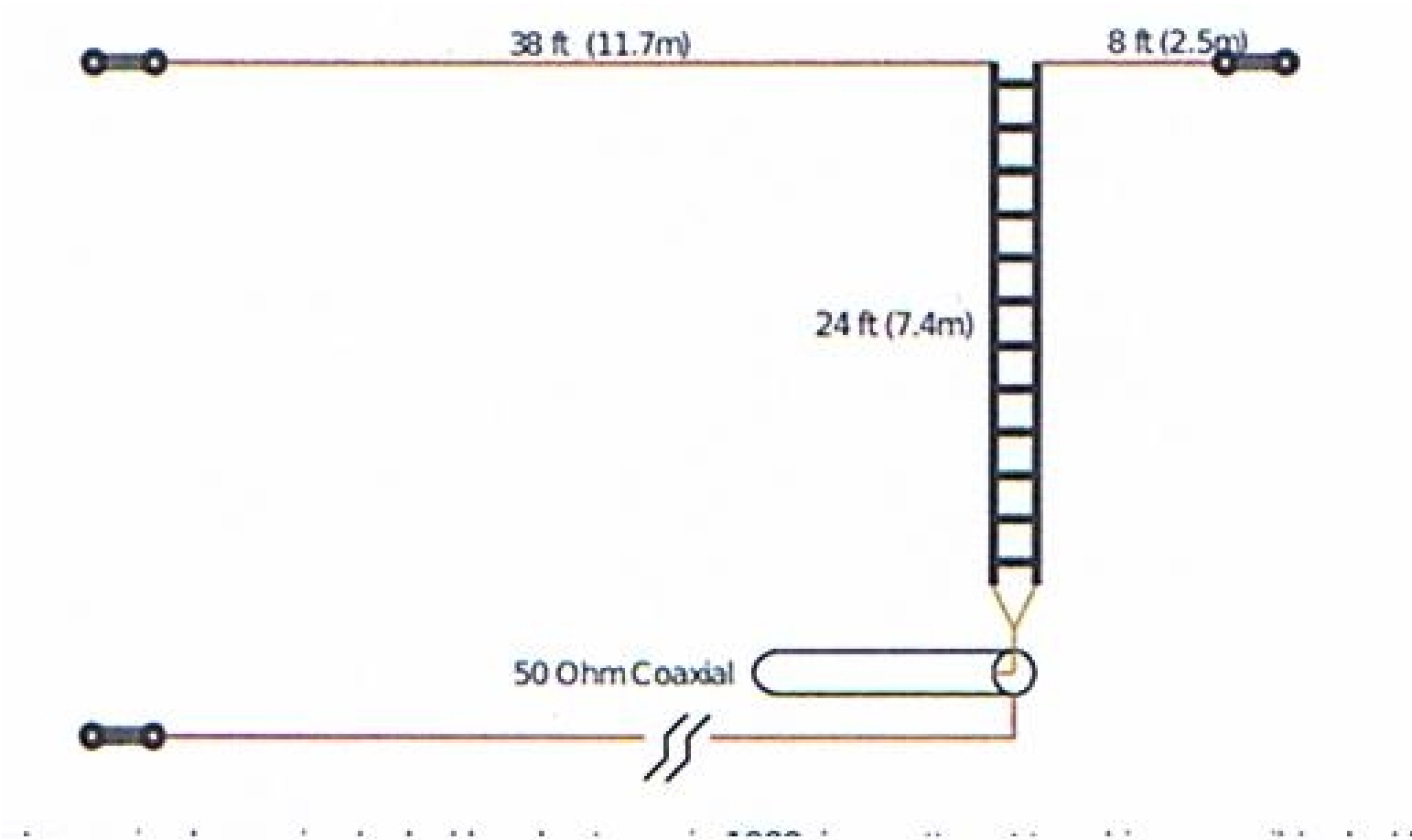
My Usage

- Although the 'L' is all band, I use it on 80,40,30 – coupler is the CG3000
- 20,17,15,13,10 catered for by the Cobwebb – which is a full size fan dipole bent around into 8ft square (with Gamma matches and balun built in) – 'the washing line'
- Now for a variant of the L - the G7FEK

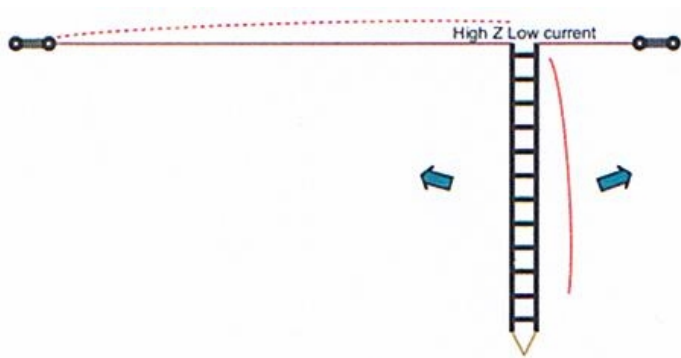
G7FEK

- Small size (46ft long x 24ft high)
- 50 ohm Coaxial Feed
- Multi-band operation for 80m to 10*m
- ATU less operation possible on up to 4 primary bands (80m/40m/20m/15m)
- Low angle of radiation dominant (good for DX)
- Easy to construct and set up

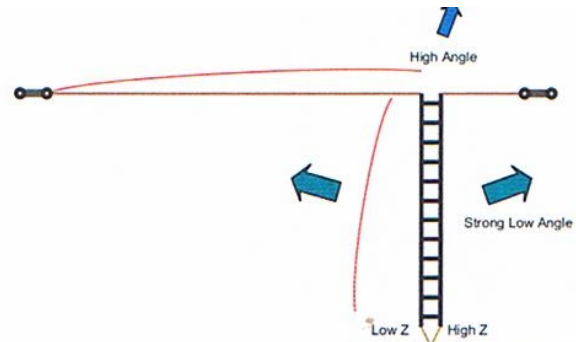
Basic G7FEK



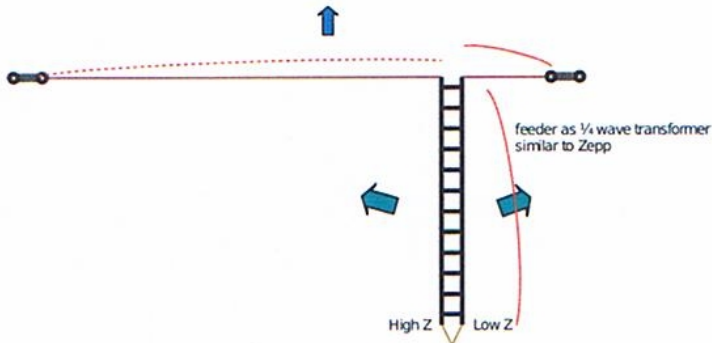
G7FEK 160,80,40,30



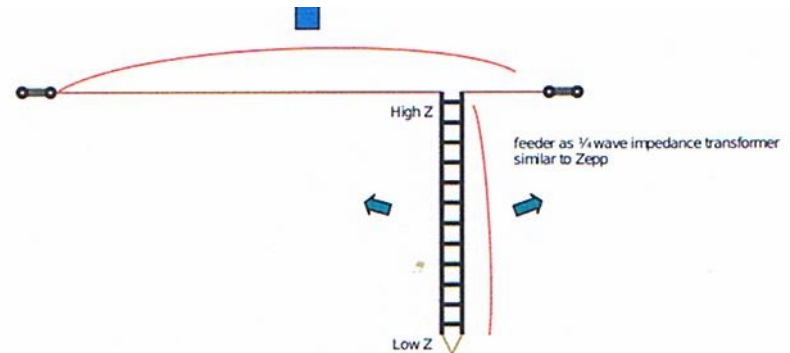
Very Low Z / Very High RF Current / Capacitive Reactance
 You can add a 35 to 45uH loading coil here for 1.8 MHz (details soon)



Energy easily coupled to 3.7 MHz element only

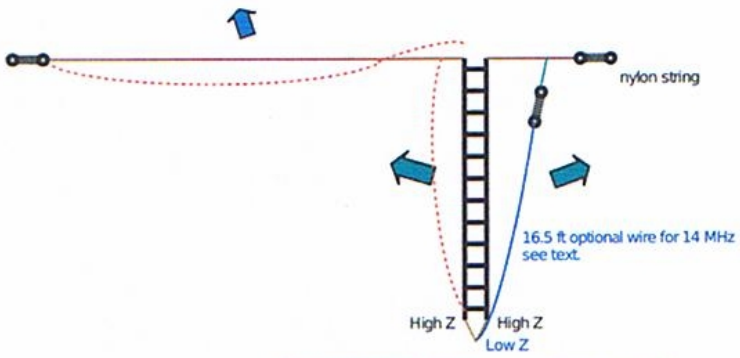


Energy easily coupled at 7 MHz

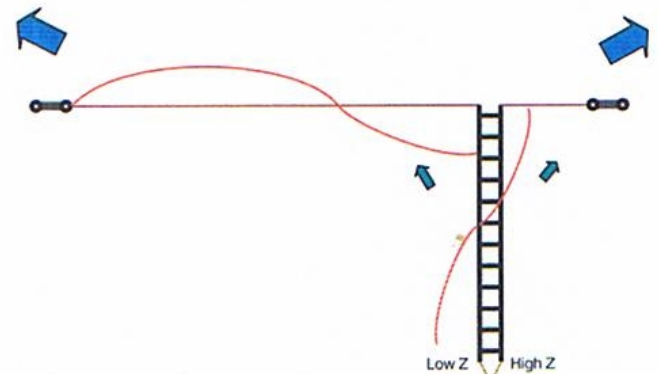


Energy easily coupled at 10 MHz

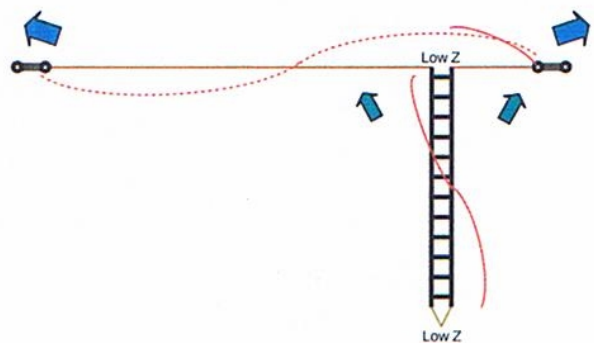
G7FEK 20,17,15,13



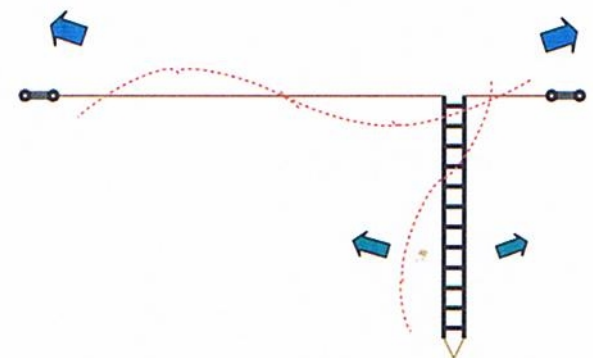
Difficult match to main antenna as Hi-Z but energy is easily coupled at 14 MHz with additional Low Z optional element



Energy easily coupled at 18 MHz to the 3.7 MHz element



Energy easily coupled at 21 MHz



moderately Low Z & high current but reactive load
Energy easily coupled at 24 MHz with ATU to tune out reactance

Finally.....

- There are ways of getting good performance from backyard antennas.....
- There is no royal road to success and no magic solutions....just adapting,adopting,and modifying the way others have done it....
- Over to you, Geoff.....