Half-Wave Flower Pot Antenna – 2M *or* 2m/70cm Dual Band

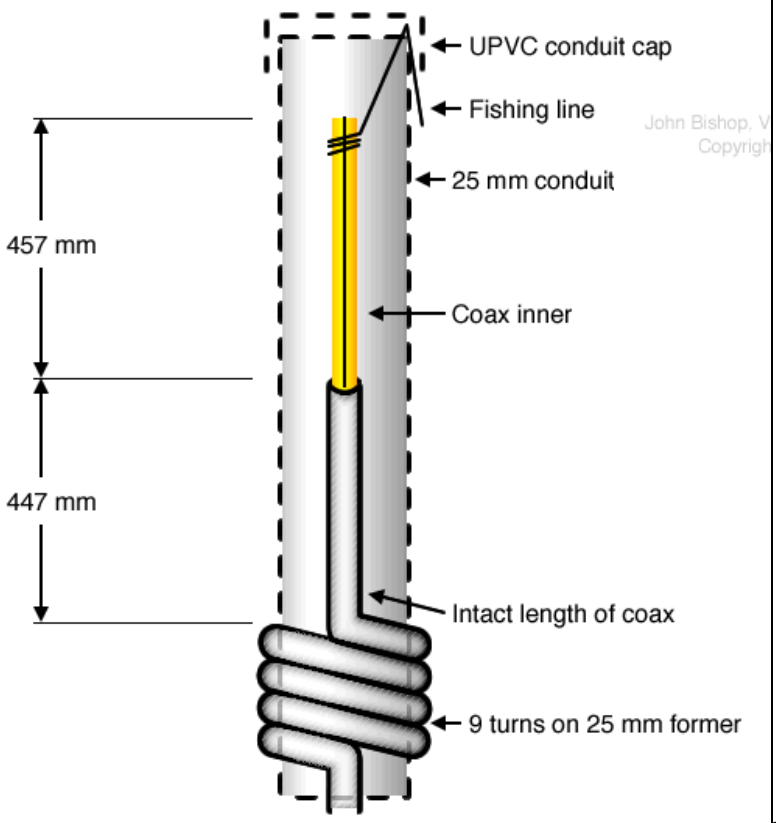


Image 1 – the Basic VHF 2M Design

This is the basic 2m Half-Wave antenna using grey 25mm conduit – to build a Dual Bander with 70cm capability – Continue the steps from Page 4.

Materials: 25mm Conduit Minimum 1metre; Coax: Min 2 metre; Nylon line 500mm, Al-foil

Longer conduit, will give more room below the coil to attach to the antenna support. [Think about YOUR mounting & choose a suitable length].

The Flower Pot is made by placing some coax inside the conduit & where it exits, making a coil on the outside.

You will strip off some black outer sheath & the metal braid inside, leaving the centre metal core protected in the white inner dielectric material. *The stripped piece of coax inner will become the 'Radiator' – the radiating portion of the antenna.*

- **Always refer back to Image 1 for the design.**
- **Read the steps, choose your conduit & coax length & test your 'turns' before continuing…**

The Conduit needs 2 holes; the coax starts inside conduit, exits out a hole, makes a coil on outside & goes back into the conduit.
Drill 2 holes into the side of the conduit for entry & exit of the coax [*see **'tips'** on easing the coax in & out*].
Make the 'top' hole approx. 925mm from the top (this distance is the length of the radiator plus a small clearance between its end and the end-cap).
The spacing between the holes must allow for 9 tight turns of your conduit.
Wind 9 coax turns temporarily on the conduit, mark & measure – then drill the 2nd hole according to your measurements.

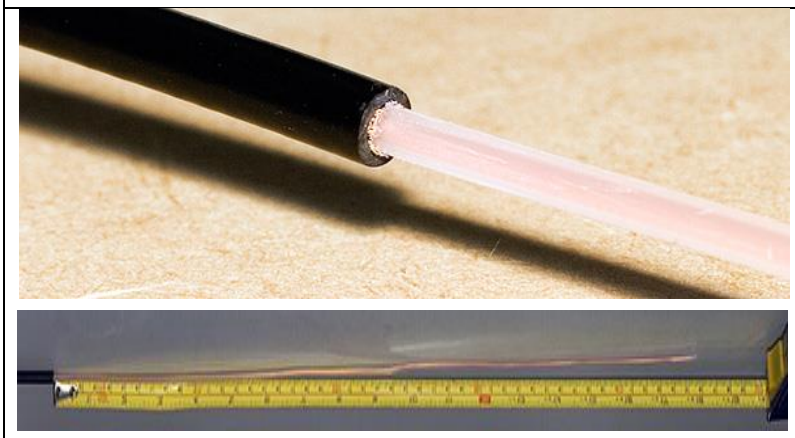


Image 3 – 457mm exposed dielectric

The Coax: ***Length is Your choice.***
2metres allows a short 'connector' tail out the bottom of the conduit [if using 1metre conduit – *for longer conduit – adjust the coax length!*].

Strip 457mm from one end. Remove **both** outer black sheath **and** metal braid to form top element. See *image 3 & refer back to image 1* for where this exposed dielectric will sit inside the conduit.
The point where black outer sheath & braid begin is called the 'feedpoint'.

Secure the top of the 'Radiator'

Take 500mm nylon fishing line or similar.

Tie fishing line to the top of the upper element securely. This line will be used to pull the radiator taut; it will clip over the top of the conduit – [*see Image 1*]

Later you will make a notch at the top of the conduit to hold it in place.

Image 5 – Mark 447mm on coax

Measure/Mark Coax: Measure 447mm down from the feedpoint (the point where braid/outer sheath now starts); *See Image 5*

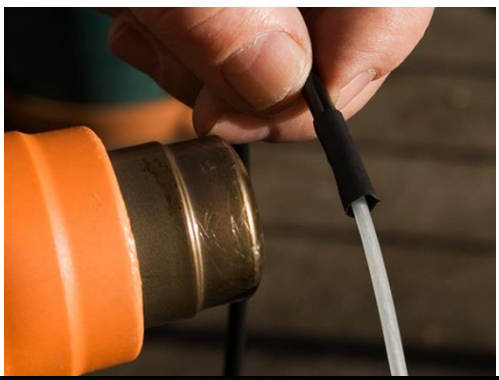
This is the point where coax exits the conduit & the coil begins i.e. it's the distance to the start (or top) of the choke coil.

Mark this point on the coax as a reference/stop point when inserting the coax into the conduit.

Some Steps prior to installation:

File the holes 'sideways'; file to the shape of the coax going & and coming out on the angle see photo right.

Heatshrink the feedpoint to seal against water entry.



To assemble antenna:

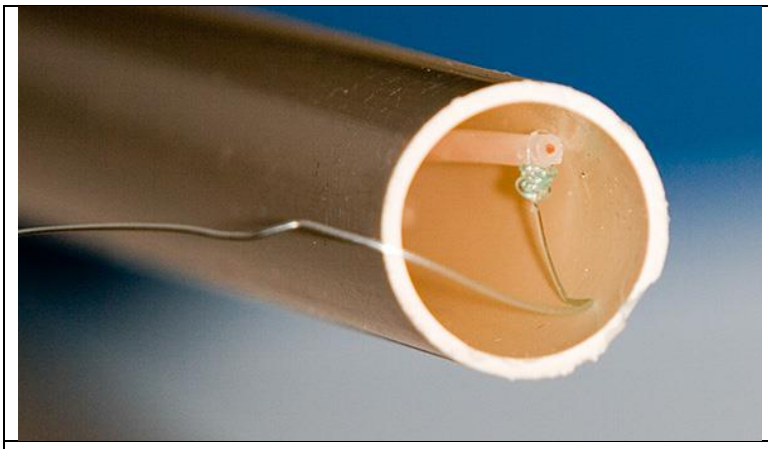
Insert the radiating portion (together with the piece of nylon line) through the top coil hole.

Manoeuvre it to top of conduit.

Stop when your 'marker' reaches the top coil hole.

See Image 9 – Your mark should just disappear into the hole.

Image 9 insert coax to your 'mark'



Fish-out the nylon line and pull it taut.
Temporarily straighten the radiator.
This will "set" the bend at the choke coil top.

Make a 9 turn choke/coil on the outside of the conduit

Form the coil – your previous practice should have given you precise hole distances.
Ensure the 'mark' on the coax remains at the top hole & isn't lost in the conduit or made part of the coil.
After 9 turns, insert the end of the coax back into the conduit, push it down & out the bottom of the conduit.
See image 11- note tight coil of 9 full turns.

Image 11 – choke, note 9turns & mark visible at hole

Cut notch in top of conduit

Make a small notch in the edge of the conduit, pull the nylon line taut and catch the nylon line in the notch.
This ensures the radiator remains at 457mm long inside the conduit.

Fit a connector to lower end of the coax; measure the SWR & if necessary trim the top element – or add a little length by soldering a scrap of wire.
Once satisfied with the SWR, fit a conduit end-cap to clamp the nylon line in place and hold the radiator straight

Finishing Tips

Don't block or seal the bottom end of the conduit. This is to allow condensation to drain away.
Silicone/seal the coil entry and exit holes to minimise water entry

Heatshrink the bottom end to provide a buffer for the exiting coax and neaten the base.

Wrap PVC tape over the coil and the entry/exit holes to minimise water entry

Don't use coax with a foil shield as the foil tends to break at the sharp bends at the choke entry/exit points. If this happens, the antenna will not work!

RG58 Coax Self Resonant Frequency (MHz)			
Coil Turns	PVC Conduit Former Diameter		
	25mm	32mm	50mm
4	-	160	-
5	150	136	85
8	142	106	65
9	135	100	60
10	129	95	57
12	117	84	52
15	105	75	47

2m/70cm Dual Band Half-Wave Flower Pot Antenna

The idea

The half wave 2M version of the Flower Pot antenna is easily modified to a dual band antenna for operation on a band that is the [approximate] third harmonic of the fundamental resonance. [e.g. 145MHz x 3 = 435MHz – that's 2M to 70cm or VHF to UHF]

The modification involves placing a coax phasing sleeve of aluminium foil around the outside of conduit.

First construct the 2M antenna , then fit the sleeve as shown in image 14.

The Science

Operation on the third harmonic is achieved by using a sleeve technique so as to form quarter wave phasing sections (at the higher frequency) to end feed two half waves in phase at the third harmonic.

This arrangement provides useful gain (3dB) on the higher band. The sleeve technique maintains the impedance matching for both bands and (probably fortunately) there is sufficient longitudinal impedance in the choke coil to provide the required isolation at the third harmonic.

Sleeve material can be aluminium (Kitchen) foil, copper foil, brass shim, building alfoil sarking or salvaged coax braid.

Dimensions for a 2m half-wave Flower Pot – WITH Outer sleeve for 70cm Band

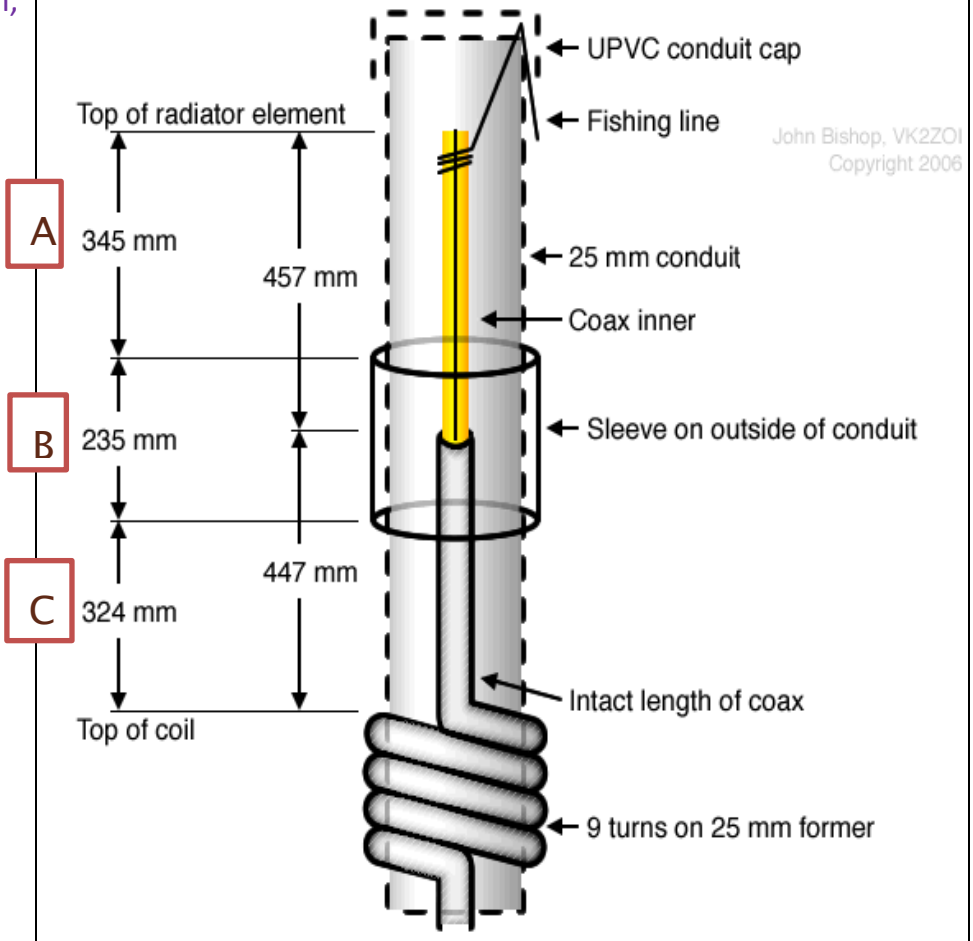


Image 14 – Design of Dual-Bander

Note dimensions in Image 14.
Foil is 235mm long and must be at least 80mm wide to 'wrap' around 25mm conduit.
Foil position is Marked as "B"
Foil top edge to top of radiator is marked "A"
Foil lower edge to top of choke is marked "C"
Foil is positioned so that the centre of foil is *over the feedpoint* [hidden inside the conduit]
Wrap the foil around the coax and fix temporarily.

Image 15

Before fixing the sleeve permanently in place, check SWR on 2m

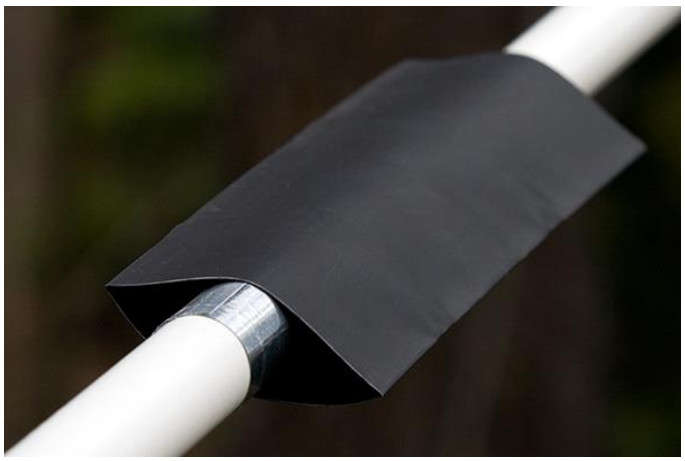
The foil sleeve should not change the 2m SWR – it may raise the resonant frequency slightly.

With the sleeve fitted, the SWR should not be greater than 1.15:1
Check SWR on the 70cm (430 – 450 MHz) band – expect SWR less than 1.2:1 at band edges and less than 1.1:1 in band centre.

If SWR is outside these limits, adjust position of sleeve (+/- 5mm max) and, if necessary, trim sleeve length to lower SWR.

IF trimming sleeve length (*dimension "B"*) adjust dimensions A and C accordingly to keep centre of sleeve adjacent to feedpoint of the inner 2m radiator.

When satisfied with the SWR, fix foil in place and protect the sleeve with UV protected PVC tape or heatshrink.



Loss in grey electrical conduit
Grey electrical conduit is lossy, however it is very UV resistant. The design compensates for the effect of the conduit by shortening the elements (by about a 2% factor) but otherwise the conduit appears to have little effect on the radiation efficiency.

This document is prepared by VK4ION

For BARC Members

The original document & images come from VK2ZOI