

# Official Bulletin



## MHz to GHz

The West Australian VHF Group Bulletin

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THE WEST AUSTRALIAN VHF GROUP (INC)  
PO BOX 189 APPLECROSS 6953

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### 1. Rucksack portable antenna – Leigh VK6WA

*(It was decided to make a separate part 2 due to the length of John contribution)*

Many thanks John - Ed Terry VK6ZLT

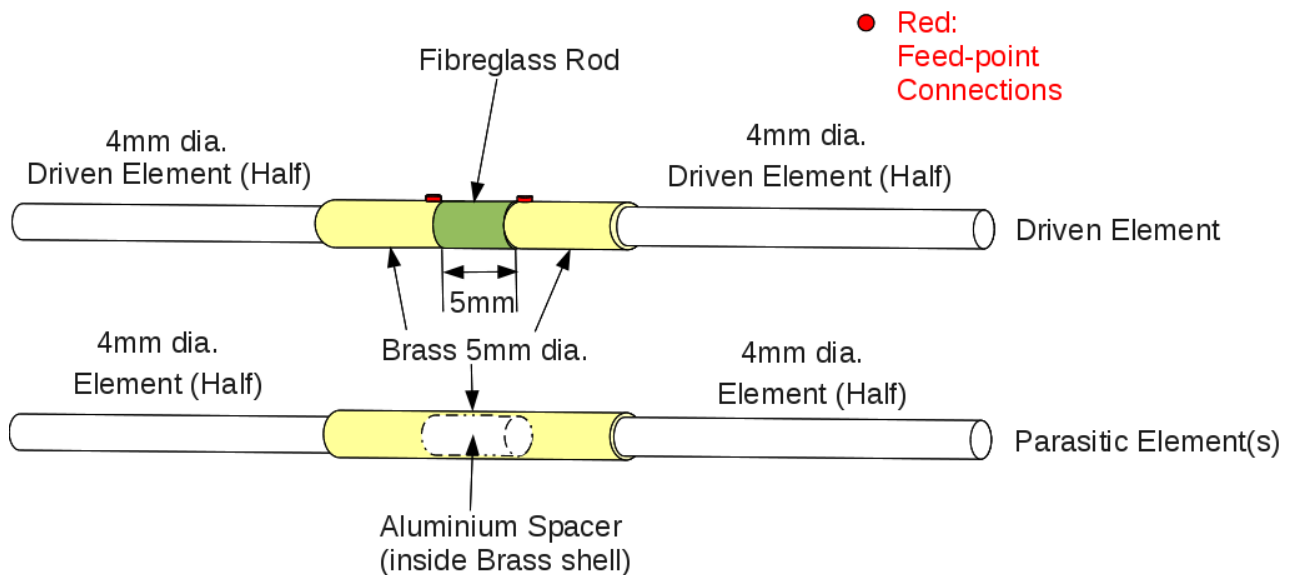
# VHF / UHF Rucksack Antennas for Portable Operation

Author: Leigh Harrison VK6WA

Date: 09/02/2014

## Introduction

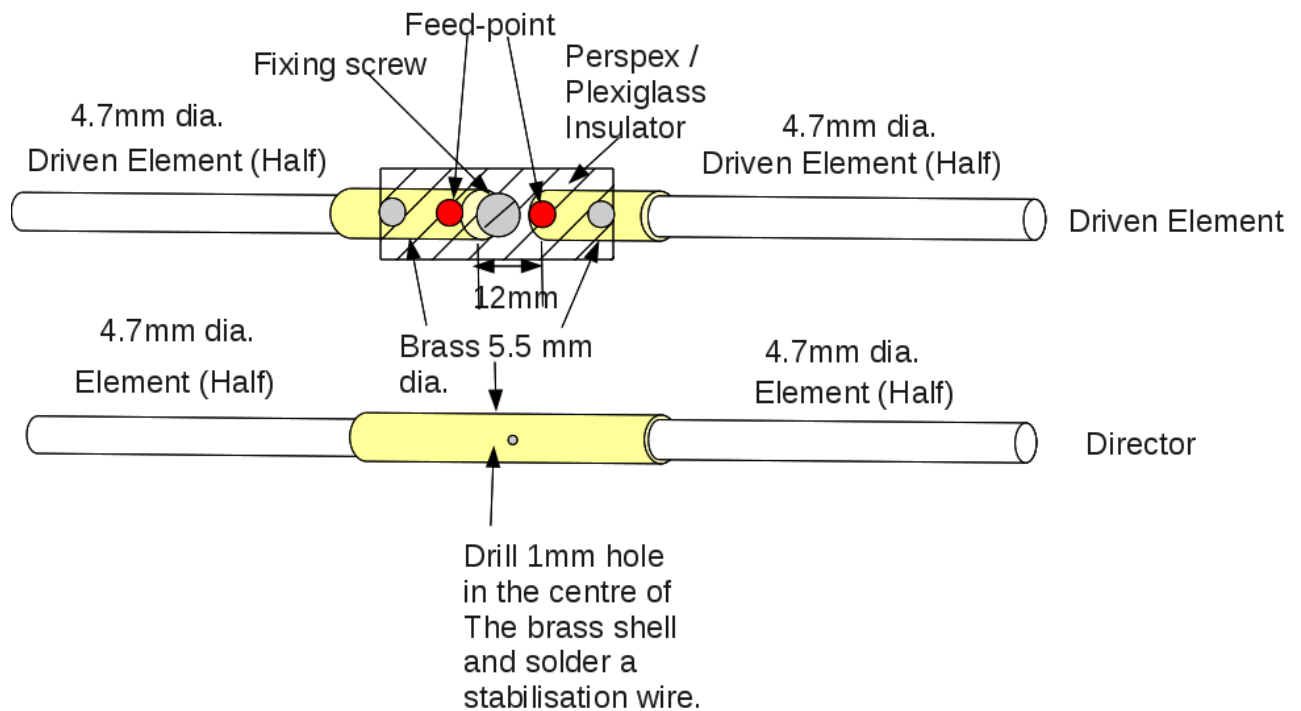
These antennas are ideal for portable operation, especially where small, light-weight equipment is a requirement. This article describes two antennas for 2m and 70cm bands which first appeared in Funkamateur Magazine in German 7. I have had to make some modifications due the non-availability of certain items. I have also modified the mounting arrangement which uses a photographic tripod. The 50 ohm matching system DJ5AM uses is based on DK7ZB's method 7. The antennas had to fit in a 500mm long space, to be a comfortable size to fit a rucksack. The general construction method is shown below in figure 1.



**Figure 1. The General Antenna Construction.**

## 2m Antenna Construction

The 2m antenna construction I used is shown below in figure 2.



**Figure 2. The 2m Antenna Construction**

The driven element assembly (including the insulator) is attached to the boom with a M3 nylon bolt and lock-nut. The driven element brass shells are attached to the insulator with M2 plated brass bolts, nuts and lock washers. The director passes directly through the boom. The element halves are pushed into the centre, separated by the 1mm stabilisation wire.

The materials for the elements, the brass shells or connectors and the boom were all purchased through a local model shop. The elements were 4.7mm (3/16 inch) diameter aluminium tube. The brass tubing measured 5.5mm o.d., 4.7mm i.d. The boom was 10.5mm and made of light-weight material.

The original DJ5AM antenna measurements are shown below in Table 1. I had to modify some of these measurements for local requirements, below in Table 2

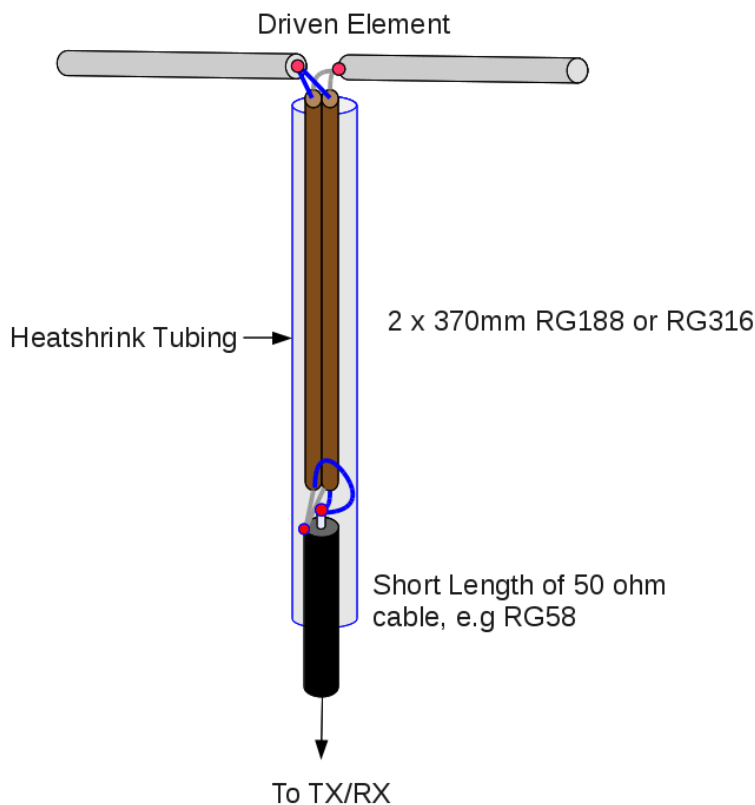
**Table 1. :** Original DJ5AM 2m Antenna Dimensions in mm. This antenna was optimised for 144.5 MHz.

Element	Position (mm)	Total Length	Half-Element Length (4mm dia.)	Distance Between Element Halves	Spacer Material	Length of Brass Shells (5 mm dia.)
Driven Element (D.E.)	0	1020	488	44	Fibre-Glass	2 x 50 mm
Director (D1)	125	977	488	1	Copper Wire	1 x 90mm

**Table 2.** : Modified 2m Antenna Dimensions in mm. This antenna was optimised for 146.5 MHz.

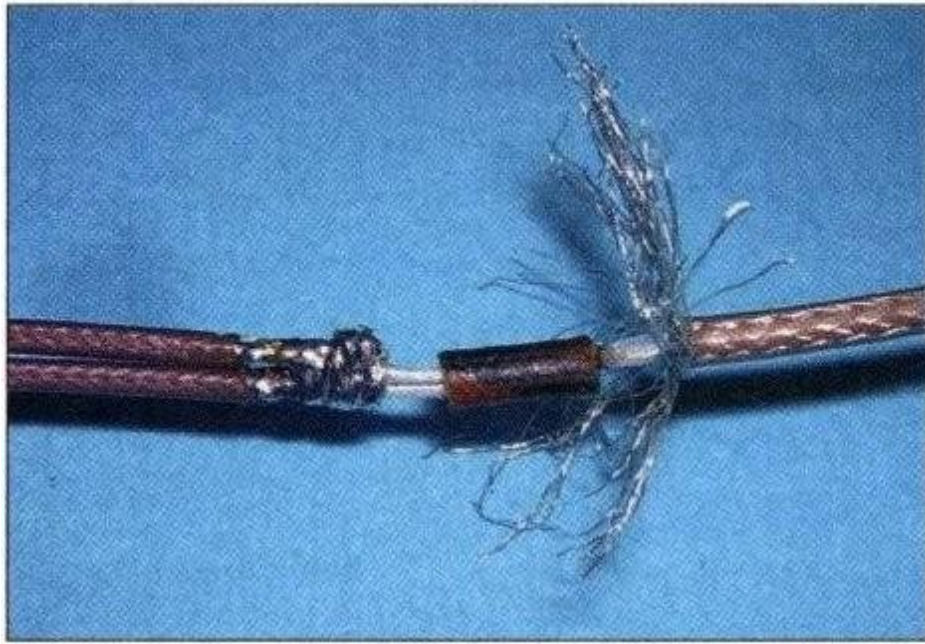
Element	Position (mm)	Total Length	Half-Element Length (4mm dia.)	Distance Between Element Halves	Spacer Material	Length of Brass Shells (5.5 mm dia)
Driven Element (D.E.)	0	1006	481	44	Perspex / Plexiglass 7	2 x 50 mm
Director (D1)	125	970	481	1	Copper Wire	1 x 90mm

The driven element presents an impedance of 12.5 ohms which must be made to match the 50 ohm coaxial cable. This impedance transformation is achieved with two parallel lengths of 50 ohm coax, 370mm long. The DJ5AM article used RG188. I was not able to obtain RG188 at the time and found RG316 to be an equivalent small cable (<http://au.element14.com/>). The arrangement of the matching section is shown below in figure 3.



**Figure 3.** DJ5AM Match based on DK7ZB method.

Figure 4 shows the method of connecting the  $\lambda/4$ , 25 ohm section to the 50 ohm feeder. This method preserves the coaxial connection by bonding the outer braid of the feeder to the two parallel cables.



**Figure 4. Connection between the matching section and feeder.**

After insulating the inner conductor soldered joint, the outer conductors are soldered together.

### Assembly of the Director

Each of the 481(488)mm x 4.7mm element halves is inserted in a 90mm x 4.7mm i.d. brass tube. A 1mm hole is bored in the centre of the 90mm brass tube and a 1mm dia. tinned copper wire passed through the hole and soldered on each side (see figures 1 & 2). If that the element halves fitted the brass tube but if any problems arise use a 3/16" drill (4.7mm) to allow clearance. In addition any small unevenness may be corrected by rubbing the ends of the elements with sandpaper. The brass connector is positioned in the centre of the boom and aligned with the driven element.

### The Boom

The boom was made from 10.5mm diameter light-weight material (e.g. fibreglass) and for the 2m beam was 250mm long. This allowed sufficient space to fit the boom into the vertical support attached to the camera tripod. Figure 5 shows the assembled 2m antenna on the tripod.



**Figure 5. Assembled 2m Antenna**

### 70cm Antenna Construction

The 70cm antenna is constructed in a similar manner to the 2m antenna. The dimensions are shown below in Table 3.

Table 3. 70cm Antenna Dimensions in mm.

Element	Position (mm)	Total Length	Half-Element Length (4mm dia.)	Distance Between Element Halves	Spacer Material	Length of Brass Shells (5.5 mm dia)
Reflector	0	336	136	64	Aluminium	90
Driven Element (D.E.)	80	312	136	40	Perspex / Plexiglass	2 x 50 mm
Director (D1)	190	310	136	38	Aluminium	90mm
Director (D2)	330	300	136	28	Aluminium	90mm

The total driven element length should be checked and adjusted to 312mm. I used an overall boom length of 450mm, which allowed a simple nylon support to be used. This was screwed into a camera tripod used as a portable mast. Figure 6 below shows the assembled 70cm antenna.



**Figure 6. The Assembled 70cm Antenna**

### **Matching the 70cm Antenna**

The method of matching the 70cm antenna is basically the same except for the impedances involved. The feed impedance here is 28 ohms; the impedance match is achieved with parallel connected lengths of RG179 (75 ohm Teflon cables), each 123mm long. I connected the matching section as per the 2m antenna but chose to use RG316 cable for lower loss. I made a suitable adaptor to BNC to fit the FT817 antenna socket.

### **Results**

#### **2 Meter Antenna**

The 2m antenna has been used successfully portable on Rottneest Island with good results and from home inside the shack. The VSWR obtained was quite good (< 1.3:1 @ 146MHz).

#### **70cm Antenna**

It appears to work! The VSWR is quite good (< 1.3 @ 432MHz). I was heard OK by a local station but I have yet to go portable with it.

*Leigh Harrison*

### **References**

1. [UKW-Antennen für den Wanderrucksack](#), Steffen Braun – DJ5AM, Funkamateure 4/07
2. <http://www.qsl.net/dk7zb/start1.htm>
3. Perspex / Plexiglass (PMMA) is not the best insulator at VHF/UHF. PE or PTFE would be the better choice for lower loss material.