HB9CV Mini Beam

The HB9CV mini-beam, because of its compact and straightforward construction, is suitable for both base station and portable use, and can be particularly useful in confined spaces such as lofts. Similar antennas are the lazy-H and ZL Special often used on the HF bands. The HB9CV version has one or two mechanical advantages that make it particularly suitable for VHF portable use.

Fig 16.38 [29] and **Fig 16.39** show two methods of construction for the HB9CV antenna. Note that a series capacitor of 3-15pF is required to adjust the gamma match/phasing combination to a VSWR of about 1.3:1 referred to 50Ω. The element spacing, and in particularly the transmission line spacing (5mm in this case), is critical for optimum impedance matching and phasing, and therefore gain and front-to-back ratio.

The principle of operation is as follows. If two dipoles are close spaced (typically 0.1 - 0.2λ) and fed with equal currents with a phase difference corresponding to the separation of the dipoles, 'end-fire' radiation will occur along the line between the dipoles in one direction, and almost no radiation will occur in the reverse direction as explained earlier in this chapter in the section on arrays.

The different element lengths found on most HB9CV antennas improve the VSWR bandwidth, not the directivity as might at first be thought by comparison with a two element Yagi antenna.

The end at which the beam is fed defines the direction of radiation. A theoretical gain in excess of 6dBd should be possible. Depending on construction techniques, gains of 4 to 5dBd with front-to-back ratios of 10 to 20dB tend to be obtained in practice.

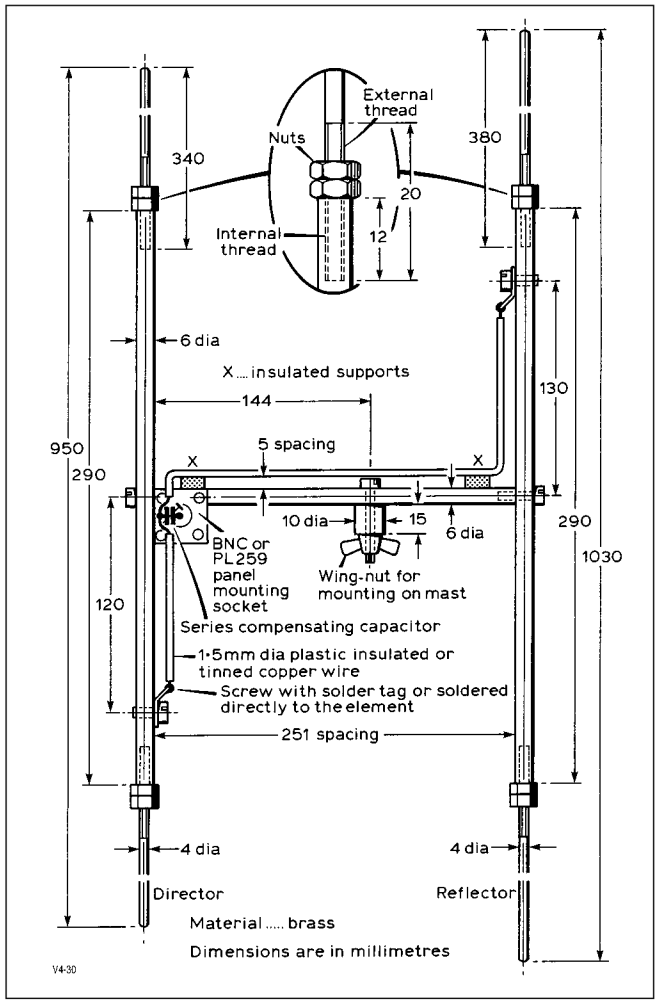

Fig 16.38 A collapsible HB9CV antenna for the 144MHz band (*VHF Communications*)

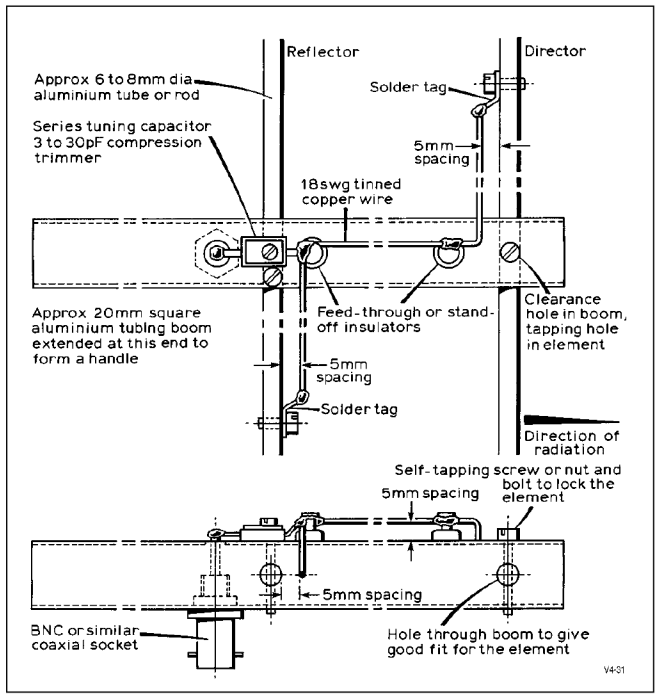

Fig 16.39: Alternative boom and feed arrangement for the 144MHz HB9CV antenna

The radiation patterns shown in **Fig 16.40** and **Fig 16.41** are for the antenna of Fig 16.38. This antenna has a typical gain of 5dBd. Note the difference obtained when mounted at 10m (30ft) above the ground compared with hand-held measurements 1-2m above the ground. The latter height is typical for the antenna being used for direction finding.

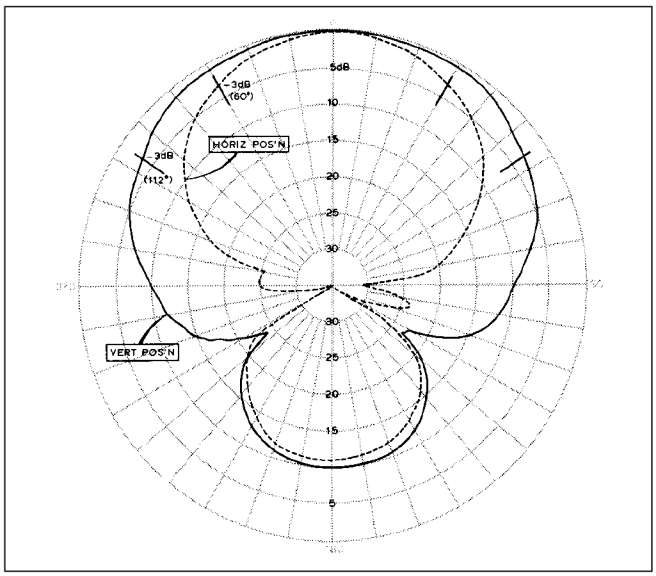

Fig 16.40: HB9CV antenna radiation patterns. Antenna 10m above ground

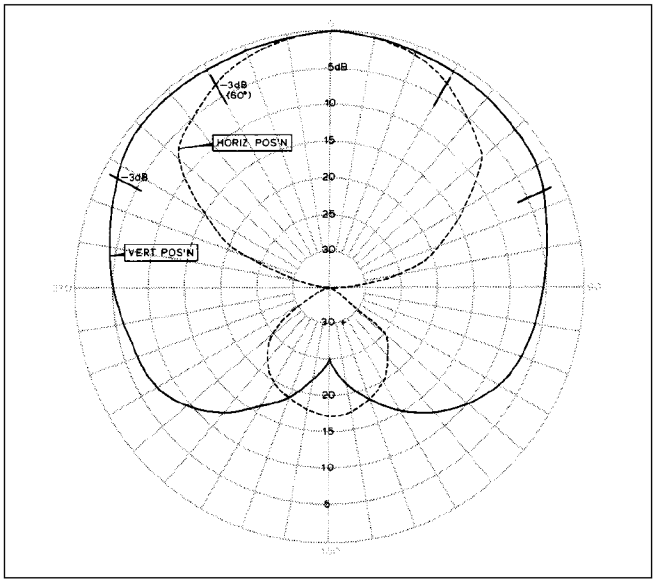

Fig 41: HB9CV antenna radiation patterns. Antenna hand-held, 1-2 metres above ground

Lightweight HB9CV for 144MHz

The compact size of the HB9CV design makes it eminently suitable for direction finding contests, EMC or interference probing, and portable work. The need for a very lightweight directional antenna for EMC investigations led to the design shown in **Fig 16.42**.

The boom and stub elements are made from thin walled brass tubing, soft soldered or brazed together. The removable elements are made from an old 12mm wide spring steel measuring tape soldered on to 4mm 'banana' plugs, although replacement tapes without housings can be purchased from good tool shops. The sharp ends must be protected by at least one layer of PVC tape or similar material. The feedline insulator where it passes through the boom can be made from Delrin or a scrap of solid polythene insulator from coaxial cable. The series matching capacitor in the example shown is 13pF, but should be adjusted for minimum VSWR, and the end of the coaxial cable and exposed connection to the capacitor should be sealed with silicone rubber compound if outdoor use is envisaged. The antenna can be supported on a simple wooden mounting using small 'Terry' spring clips to grip the boom.

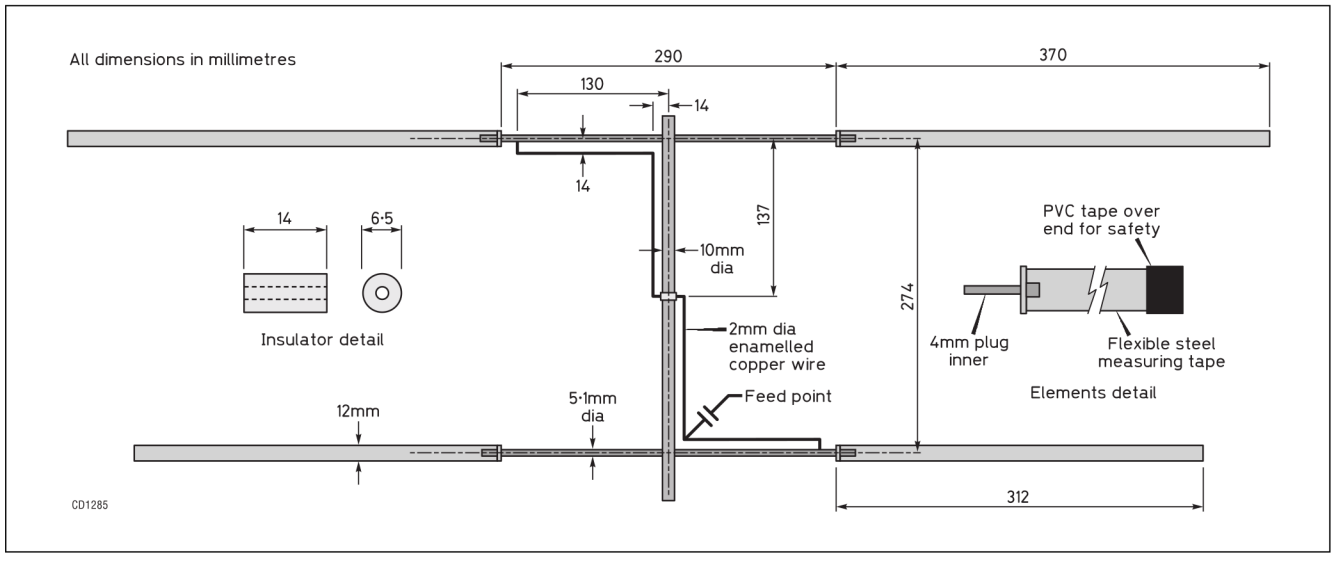

Fig 16.42: Construction details of lightweight HB9CV antenna for 144MHz