IDEAS FROM ABROAD

EUROTEK

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*A **2-element HF Deltaloop Beam** on the HB9CV principle has several desirable features.* ***Ruedi Werner, HB9RZ,*** *described his version in* **Old Man** *10/95.*

IN THE EARLY 1960s, HB9CV patented a beam antenna, consisting of a driven director resonant above and a driven reflector tuned below the operating frequency. His feed method forces the optimum phase difference of 135° between the elements. This principle has become popular with dipole elements as the 'HB9CV beam', and also, with square full-wave loops, as the 'Swiss Quad'[1]. HB9RZ's Deltaloop version performs like the 'Swiss Quad' but is easier to build and adjust, though its turning radius and height are a little larger. The development work was done on 18.14MHz.

CONSTRUCTION

THE GENERAL LAY-OUT is shown in **Fig 1**. The elements are equilateral triangles. They can be made entirely of wire, supported by an H-shaped frame of fibreglass tubing or bamboo. Dimensions, for 1mm² PVC-covered stranded wire, are given in **Table 1**. Alternatively, this frame can be made of metal tubing, with only the sloping sides made of wire.

In his 18MHz prototype, HB9RZ did it this way. For the horizontal tops of the loops he used aluminium tubing, 2.50m centre sections of 17mm OD with 15mm OD tips. HB9PWQ, for his successful 50MHz version, used a 20mm square boom and 10mm OD tubing for the horizontal element sections. Both found that all loop sides had to be increased by approx 6% over the all-wire dimensions of Table 1.

The boom length, in all cases, is λ/8. Taking a hint from HB9SL, it was found that the spacing between the bottom corners of the loops is not critical. Hence, each loop is terminated on an SO239 coax socket mounted on, and with its flange connected to, the aluminium mast.

The 18MHz antenna weighs only 2.3kg and can be turned by a small VHF-type rotator [though the great height above the feed point suggests that the stub mast be supported by a second bearing - *G4LQI*]. For 18MHz, a total height of 8 - 10m is adequate.

PHASING

THE DESIRED 135° phase lead of the director with respect to the reflector is achieved by feeding opposite ends of the loops, to get 180° shift, and feeding the director from the reflector feed point through a λ/8 = -45° coax phasing line, as shown in **Fig 2**.

The velocity factor of the coax applies; if made of RG213, the physical length of the phasing line is only 66% of its electrical length of λ/8. The phasing line may be wound around the mast or taped to it.

The UHF-series coax sockets, plugs and T are not waterproof. They should be wrapped with self-amalgamating tape or *Coax-Seal*[2].

COMMISSIONING

WITH THE FEEDPOINT at eye level, verify the resonant frequencies of each element, separately, eg with a dip meter coupled to a few small turns of wire plugged into its SO239 socket.

For best results, the director should be tuned 2.3% above and the reflector 5.7% below the design frequency. When wet with rain, the resonant frequency of the beam goes down by 50 - 100kHz (at 18MHz), so tune too high rather than too low.

Raising the beam to its operating height causes only a minor frequency shift.

THE RESULTS

MEASURED FORWARD gain was 8dBi and the F/B-ratio 12 - 15dB. The SWR was 1.1:1 at 18.135MHz, and below 1.5:1 between 17.9 and 18.35MHz. On the air, the beam is surprisingly effective.

NOTES:

[1] 'The Swiss Quad Beam', R A Baumgartner, HB9CV, *RSGB Bulletin*, June 1964.

[2] See 'Waterproofing' by John Nelson, GW4FRX, in *RadCom, January 1989* or *HF Antenna Collection* (RSGB) p184.

CORRECTION

IN LAST MONTH'S *Eurotek* (Oct 97); the first word, third line from the bottom of the top right hand paragraph is 'make'. This should read 'open'. ♦

Band	30m	20m	17m	15m	12m	10m	6m
Design frequency	10.12	14.25	18.14	21.3	24.96	28.5	50.15
Director, total length	28.99	20.60	16.18	13.78	11.76	10.4	5.91
Reflector, total length	31.38	22.28	17.51	14.91	12.72	11.31	6.42
Boom length, λ/8	3.71	2.63	2.07	1.76	1.50	1.32	0.75
Phasing line, λ/8 of RG213	2.44	1.74	1.36	1.16	0.99	0.87	0.494

Table 1: Dimensions for HB9RZ beams with wire elements on a non-conducting frame.

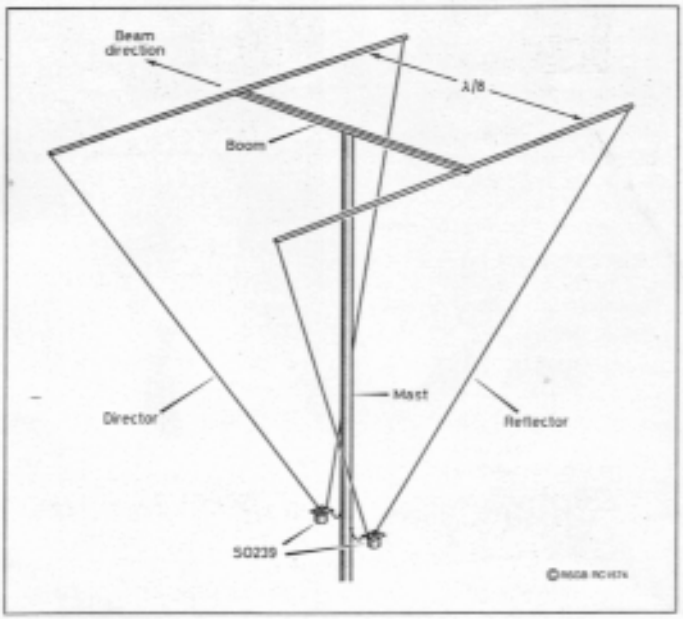

Fig 1: HB9RZ's beam has triangular loops with λ/8 spacing at the top and none at the bottom. The director is resonant above the design frequency, the reflector below it. Both elements are driven as shown in Fig 2.

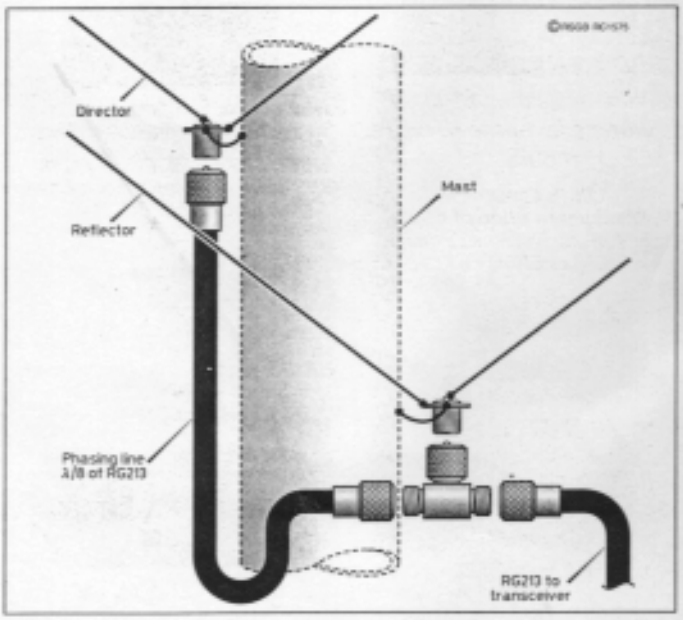

Fig 2: 135° phasing is obtained by connecting opposite ends of the loops to the mast for 180°, then lagging the director 45° by feeding it through a λ/8 phasing line.