TECHNICAL TOPICS

Pat Hawker. G3VA

Groundplanes again

Alan Boswell, G3NOQ, suggests that some readers may have been unnecessarily put off using vhf groundplane antennas by W6HPH's analysis in IT November 1981: this warned of a "3dB loss" compared with a vertical dipole. They may have gained the impression that half the total radiation is "lost" when a 1/4 w radialor mounted over non-infinite radials is used. He stresses that dipoles and monopoles' both radiate virtually all the energy fed to them, and to believe otherwise would contradict the fundamental laws of conservation of energy. Only a small part of the total energy would be accounted for by the cross-polarized radiation over a small groundplane. as mentioned by John Wilson. G8KIS.

considers that rhe λ/4 monopole with vehicle-roof groundplane forms an excellent omni-directional antenna ideally suited to hf mobile operation. Although a vertical dipole theoretically is the better antenna (since it combines with its "image" in the ground to form a colinear array having a narrower beam in the vertical plane), for most mobile work this would be an impractical. unduly expensive, system. Though he admits being surpriscd that the fixed vertcal trap dipole has not found more favour among hf operators, as the full feed current does not flow into lossy earth (a point made last year in the earlier discussions on vertical antennas).

I hope 1do nobody an injustice, but I have a sneaking feeling that G3NOQ may have rather misinterpreted W6HPH's analysis of the 3dB loss, or else that I have misunderstoed G3NOQ's comments. The 3dB loss occurs only for radiation in the horizontal plane, and is made up for by additional radiation at higher vertical angles. Omnidirectional antennas frequently have appreciable gain or losses in specific planes by virtue of their vertical radiation pattern. This is seldom taken into account at hf, where the useful vertical angle radiation varies with height of the ionospheric layer etc. But, for example, vhf/uhf omnidirectional broadcasting antennas may have a colinear gain of over 10dB towards the horizon or tilted slightly downwards). A uhf television station can have I,000kW effective radiated power from transmitters providing only, say, 50kW peak output power.

One must, however, agree with G3NOQ that the whole subject of antenna gains and losses offers enormous scope for "sophistry, semantics and what is known in the trade: as specmanshipt i.e. why say your antenna has a gain of 12dB when with some subtle redefinition you can say the gain is 18dB?"

It is all too true that the gain of any antenna depends on how you define gain–one reason why *QST* never allows advertisers to publish even a "claimed gain" figure for antennas!

Controlled-current-distribution antennas

Last year in *TT* June and October, an account was given of VK5NN's recent work on capacitively-loaded (stretched) antennas. for hf and vhf, exploiting the advantage of this technique as first described in detail in 1961 by "Dud" Chatman. G6CJ *(ART)*.

Harry A.Mills, W4FD, and Gene Brizendinge, W4ATE, have sent me extract.. from IWO ankles (they wrote on hf "ccd" (controlled-current-distribution) antennas in 73 *Magazine* (October 1978 and July 1981). The ccd antenna is basically a capacitively-loaded antenna strctched by a factor at two, as in the original EMI/G6CJ system, but with the addition of some capacitive end-loading (US patent 3,5M,551 granted to W4FD)_The use of

Table I - CCD (stretched) antenna dimensions

Band (MHz)	length (ft)	(m)	Section (in)	(cm)	No of sections	Capacitors (pF)	No of capacitors
1-8	560	{170·71	140	13561	48	1,560	46
3-5	280	185·41	70	11781	48	780	46
7	140	142·71	35	1891	48	390	46
''	70	(21·31	17·5	144-51	48	195	46
21	46-5	(14·21	11·5	1291	48	130	46
28	35	110·61	8'75	1221	48	97·5	46

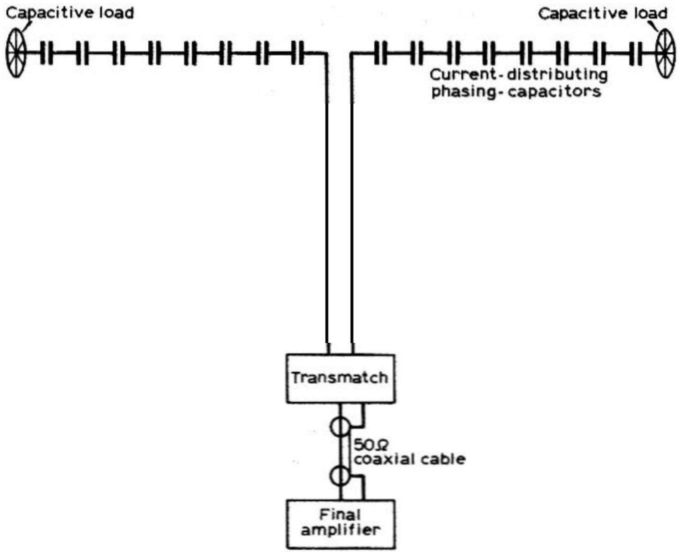

Fig 1. The "controlled-current distribution" antenna is stretched dipole) as described by W4FD and W4ATE_It seems likely that the end capacitative loading could be dispensed with without seriously affecting results

end-loading is claimed to further reduce dielectric and ground losses and lower the vertical angle of radiation while retaining the many advantages of stretched elements. It is felt that the following notes on the construction of such elements will prove useful to those whose interest in this system has been aroused and have the space to allow its exploitation.

Fig I. shows a typical dipole element loaded in accordance with Table I. For other capacitor values or frequencies the authors give:

Number of capacitors = f(MHz) x C(pF)/59'35

Number of wire sections(S) = number of capacitors plus two

Overall length (L) in inches = 984 x 12/f(MHz)

Length of wire sections = *LIS*

Twelve constructional hints were given, as follows:

(I) Select wire section lengths and capacitor values from Table 2 for the required band (measure to centre of insulators).

(2) Saw small insulators (0'6 by I·75in, 15·8 by 44·5mm) from O'13in (3'2mm) sheet plastic (or alternatively use O'5in, 12·7mm plastic waterpipe both for insulation and to protect the capacitor).

(3) Match capacitors to within five per cent using only polystyrene, silver mica, mica or mylar (100V rating is adequate for IkW).

(4) Connect the wire sections to the insulators, ensuring section lengths are accurate between centres of adjacent insulators.

(5) Scrape wire ends clean and solder well the capacitors across the insulators. omitting capacitor at the centre feedpoint.

(6) Build two simple end-loading 24in (61cm) diameter "wheels" of copper wire using for example No 10 stripped house wire for the rim and No 14 to 18 bare copper wire for eight "spokes". Carefully solder all joining wires.

(7. Carefully solder the centre of the wheels to the ends of the ccd element.

(8) Suspend the antenna (without feeder) about 6ft (1.83m) high, for resonating and testing.

(9) Connect a one-to-two-turn coil to centre feedpoint and couple a dip meter, vswr or noise bridge, and adjust the ccd length to resonate at the *low* frequency end of the band. removing or adding an equal number of complete wire/capacitor sections from each end as necessary.

(10) Remove test instrument and connect a 300Ω line bel een the ccd element and the antenna tuning unit (alternatively use coaxial cable with 4:) balun at the ccd centre).

(11) Apply reduced power and test to ensure that power is distributed to ends of antenna by using a small neon lamp or other rf indicator against the antenna. Start at the antenna centre and explore all sections towards each end (if rf voltage indication is lost, it is probable that the last capacitor is poorly soldered or defective and needs 10 be replaced by another matched capacitor.

(12) Contact several stations with full power, before raising the ccd element to its final height. Note that the resonant frequency of the element will change by only an insignificant amount as the antenna is raised (one of the features of a capacitively-loaded element. If space is limited, erect as inverted-V dipole, or let antenna ends hang down. W4FD and W4ATE consider that such a W/12 dipole (physically I>. long) can form aver)' effecnve antenna, but point out that many other configurations are possible.