RESEARCH DEPARTMENT

Band III transmitting aerial for the Wenvoe television station

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THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION

RESEARCH DEPARTMENT

BAND III TRANSMITTING AERIAL FOR THE WENVOE TELEVISION STATION

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INTRODUCTION

A second v.h.f. television transmitter has been installed at Wenvoe to radiate the BBC Television Service for Wales. The transmitter came into operation on 9th February 1964.

SUMMARY OF INSTALLATION

Site: The site is 5 miles (8 km) west-south-west of Cardiff, grid ref. ST/111742, height 422 ft (129 m) a.m.s.l.

Support Structure: The support structure consists of a 625 ft (190 m) triangular stayed mast having a side dimension of 6 ft 6 in (2 m). The stays are attached to the mid-points of the mast faces and the mast orientation is such that one stay is on a bearing of 77·9° ETN. The new Band III mast is spaced 159 ft (48·5 m) on a bearing of 344·7° ETN from the 750 ft (230 m) mast which supports the aerials for Bands I and II.

General Arrangement: See Fig. 1.

Channel: Channel 13, with vertical polarization, is used. Vision and sound carriers are not offset.

Aerial: The aerial has twelve tiers comprised of six panel units mounted on each mast face; each panel consists of two tiers of full-wave vertical dipoles arranged as shown in Fig. 2. The mean inter-tier spacing is 1·09λ and the mean height 581 ft (177 m) a.g.l. Each two-tier set of three panels is fed with currents in the following relationships:

Panel	Amplitude	Relative phase
CA (two dipoles)	1·0	0°
AB (four dipoles)	0·63	-198°
BC (four dipoles)	0·55	-252°

There are independent main feeders to each half aerial. The dipole feed points are covered by a system of fibre-glass support tubes and P.V.C. ice-protection pods.

Power: Two 10 kW transmitters are used. See Note 1.

Templet and horizontal radiation pattern (h.r.p.): Fig. 3 shows the templet and the h.r.p.s at vision and sound carrier frequencies. Fig. 4 shows the estimated effective h.r.p. (i.e. the h.r.p. taking into account the effect of re-radiation from the 750 ft (230 m) obstacle mast) over the arc 130° - 170° ETN. In directions other than the deep minimum in the h.r.p. the amplitude of the ripples is about ± 0·5 dB. (See Note 2).

Vertical radiation pattern (v.r.p.): Fig. 5 shows the normalized v.r.p.s for each six-tier half aerial, and also for the whole aerial. Since the 5·8° minimum affects the nearer outskirts of Cardiff, gapfilling measures are incorporated in the aerial. The 1·5° beam tilt was required to provide sufficient e.r.p. towards those parts of Barry situated in the minima of the effective h.r.p. shown in Fig. 4.

The beam tilt and gapfilling of the v.r.p. are achieved by phasing the currents in the aerial tiers as follows:

Tier number	Relative phase	Tier number	Relative phase
1 (top))	0°	7)	-72°
2)		8)	
3)	-34°	9)	-91°
4)		10)	
5)	-53°	11)	-95°
6)		12)	

Gain:

Mean intrinsic gain		11·8 dB
Deduct: losses due to gapfilling and possible misalignment	0·6 dB	
loss in distribution feeders	0·2 dB	0·8 dB
Mean net gain		11·0 dB
Deduct: loss in main feeder (type Styroflex $3\frac{1}{8}$ in (8 cm) dia. semi-flexible)	1·6 dB	
network loss	0·4 dB	2·0 dB
Mean effective gain		9·0 dB

Programme Link: The programme is obtained by GPO line.

Notes:

1. Despite aerial gapfilling, distorted reception is possible in areas situated in the v.r.p. minima due to differences in the transmitter modulation characteristics. To avoid this the transmitters are first paralleled (by means of a diplexer) and the combined output then split to provide the feed to each half aerial.

2. The aerial was designed by the aerial contractor, the final arrangement being determined by measuring the h.r.p. of a full scale prototype of one half of the aerial mounted on a turntable. The stringent h.r.p. requirements were met by adjusting,

   (a) the positions of the dipoles on the panels

   (b) the relative amplitude and phase of the current fed to each panel

   (c) the inclination of the panel to the mast face.

   It was also necessary to add the shaping screen shown in Fig. 2.

ACKNOWLEDGEMENT

The aerial was designed and constructed by the aerial contractor, under the general direction of Planning and Installation Department.

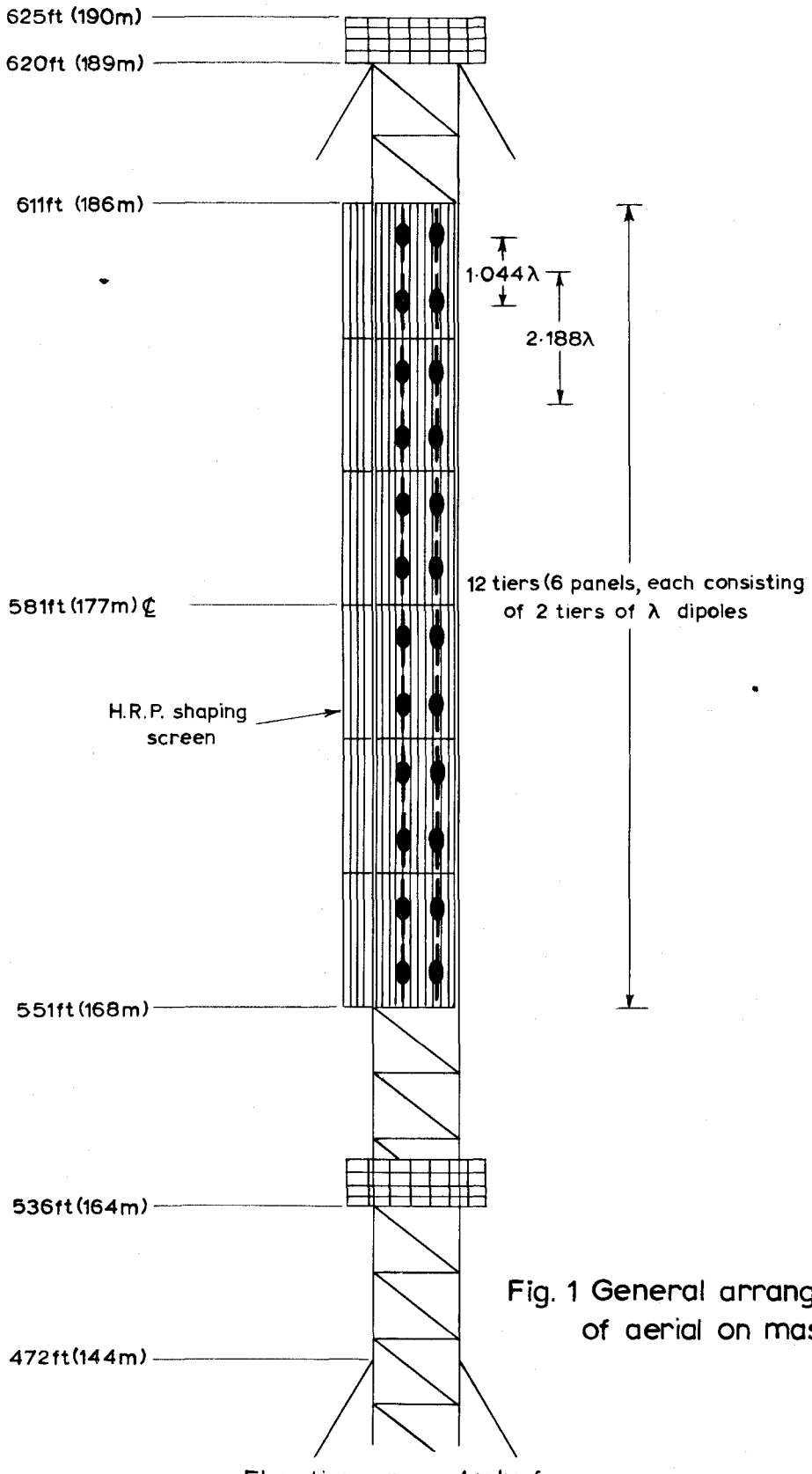
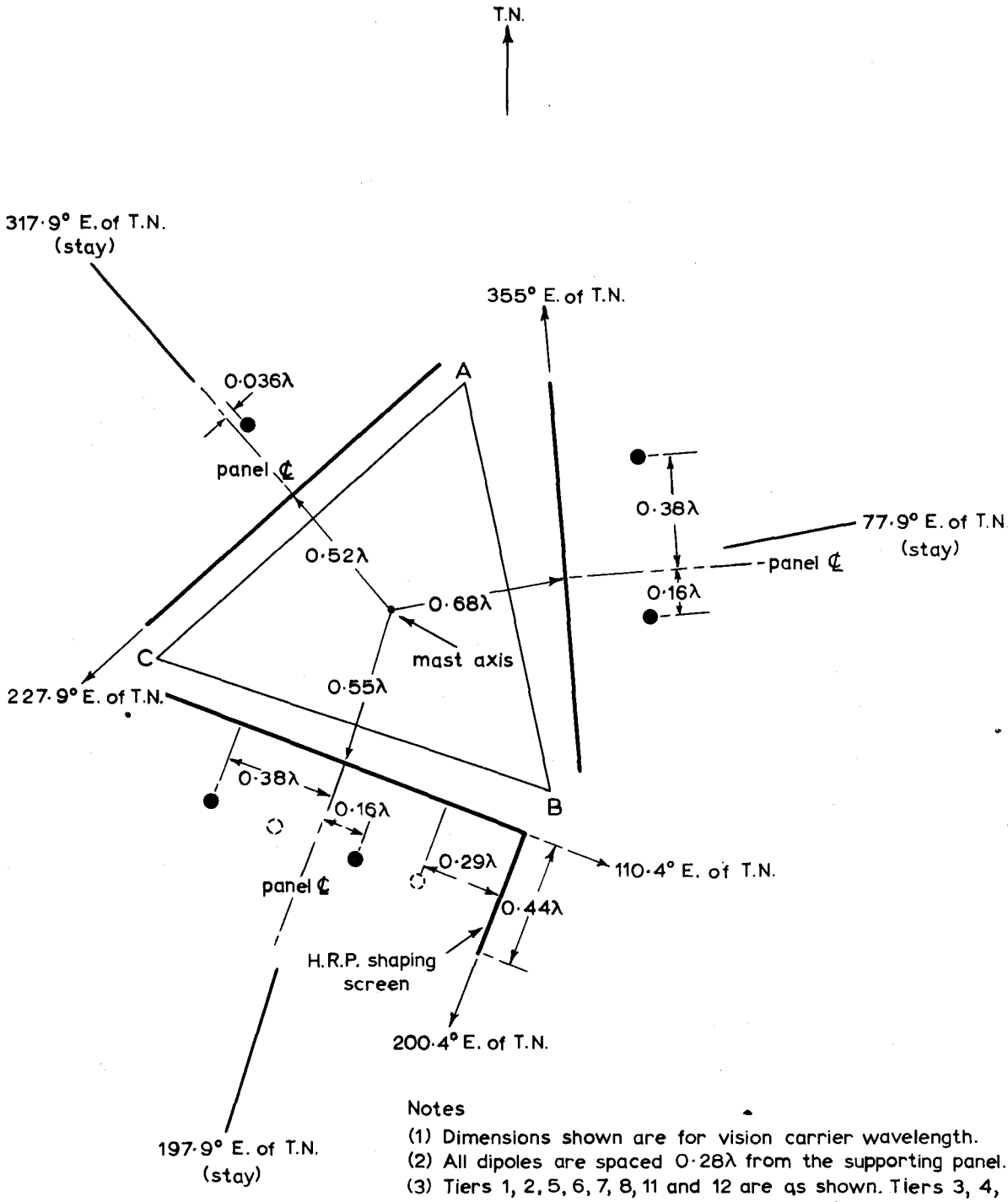


Fig. 1 General arrangement of aerial on mast



Notes

(1) Dimensions shown are for vision carrier wavelength.
(2) All dipoles are spaced 0·28λ from the supporting panel.
(3) Tiers 1, 2, 5, 6, 7, 8, 11 and 12 are as shown. Tiers 3, 4, 9 and 10 differ in that the dipoles (shown dotted) on face BC are offset from the panel centre line by the same amount but in the opposite direction.

Fig. 2 Plan showing arrangement of panels

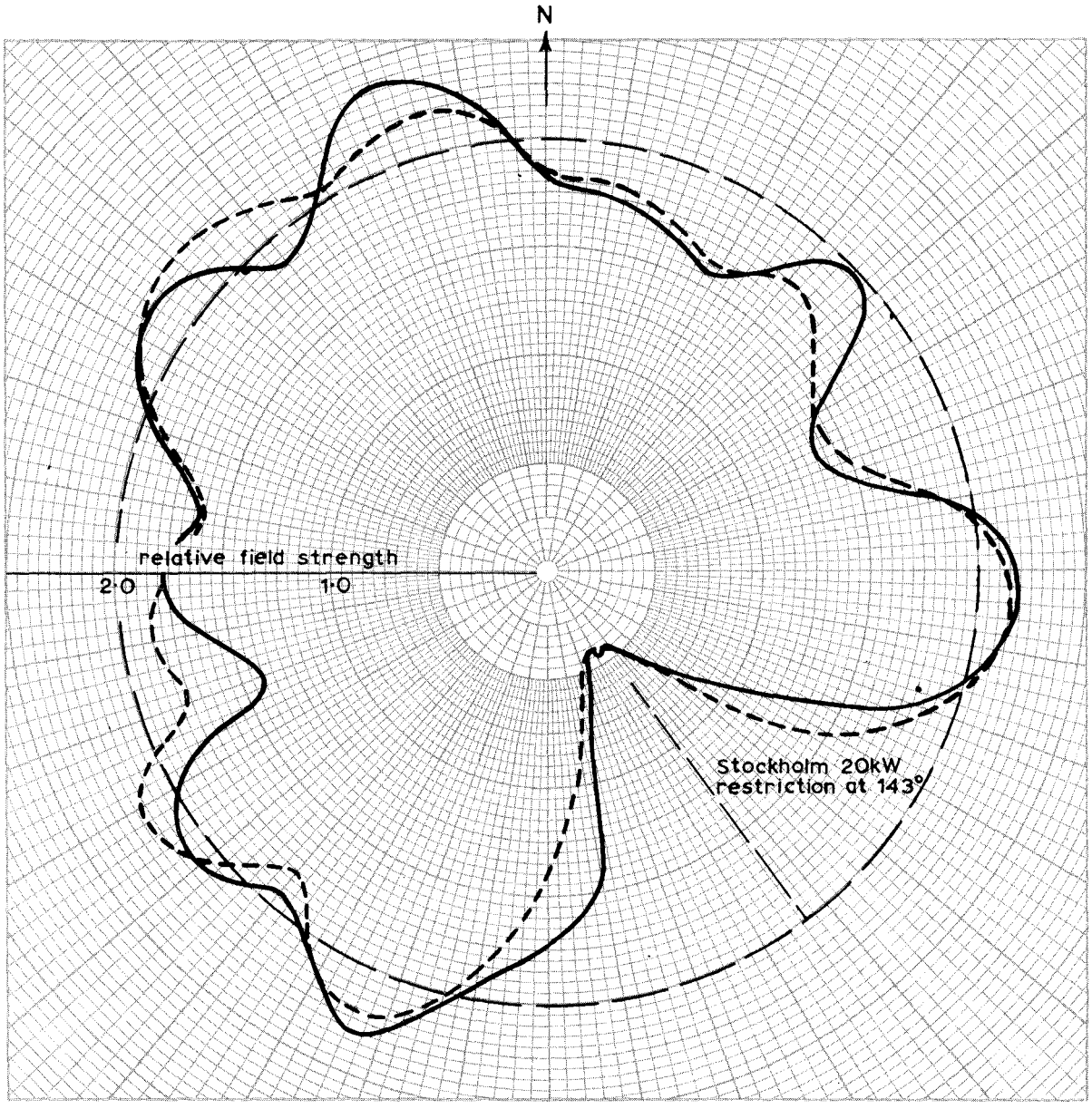


Fig. 3 Templet and horizontal radiation patterns

VERTICAL POLARIZATION

Channel 13 (Vision carrier 214·75Mc/s Sound carrier 211·25 Mc/s)

Mean effective gain 9·0dB
Transmitter power 2 x 10kW
Mean E.R.P. 159kW

—— —— Maximum permissible E.R.P.
——— H.R.P. at vision carrier
------- H.R.P. at sound carrier

Unit field corresponds to an E.R.P. of 50kW

H.R.P.s are scaled to the maximum of the V.R.P., i.e. at 1·5° below the horizontal

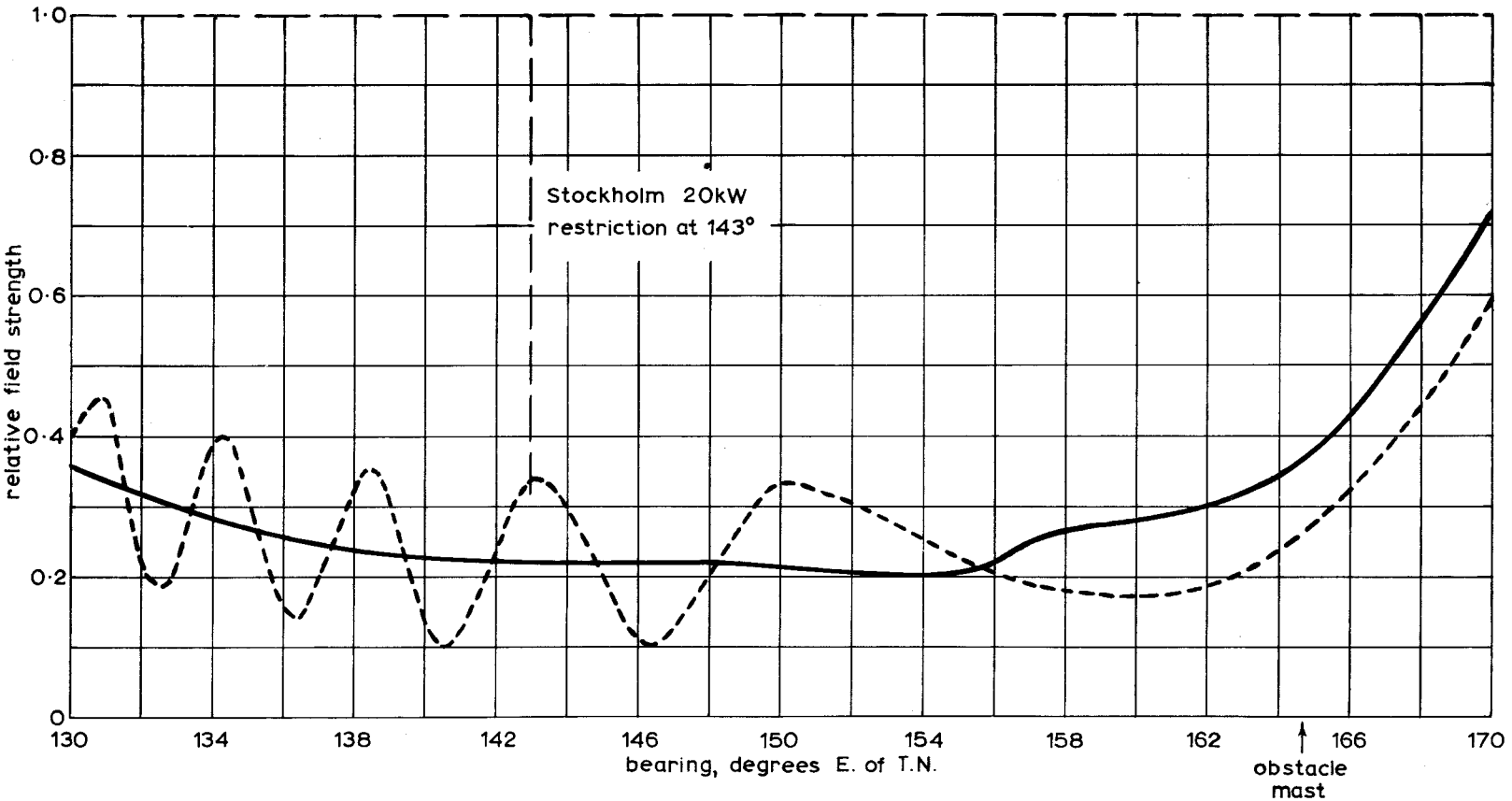


Fig. 4 Horizontal radiation pattern over 130° – 170° E. of T.N. showing effect of re-radiation from obstacle mast

—— —— —— Maximum permissible E.R.P.

———— Aerial H.R.P.

- - - - - - - Effective H.R.P. (scaled to the maximum of the V.R.P., i.e. at 1·5° below the horizontal)

Unit field corresponds to an E.R.P. of 200kW

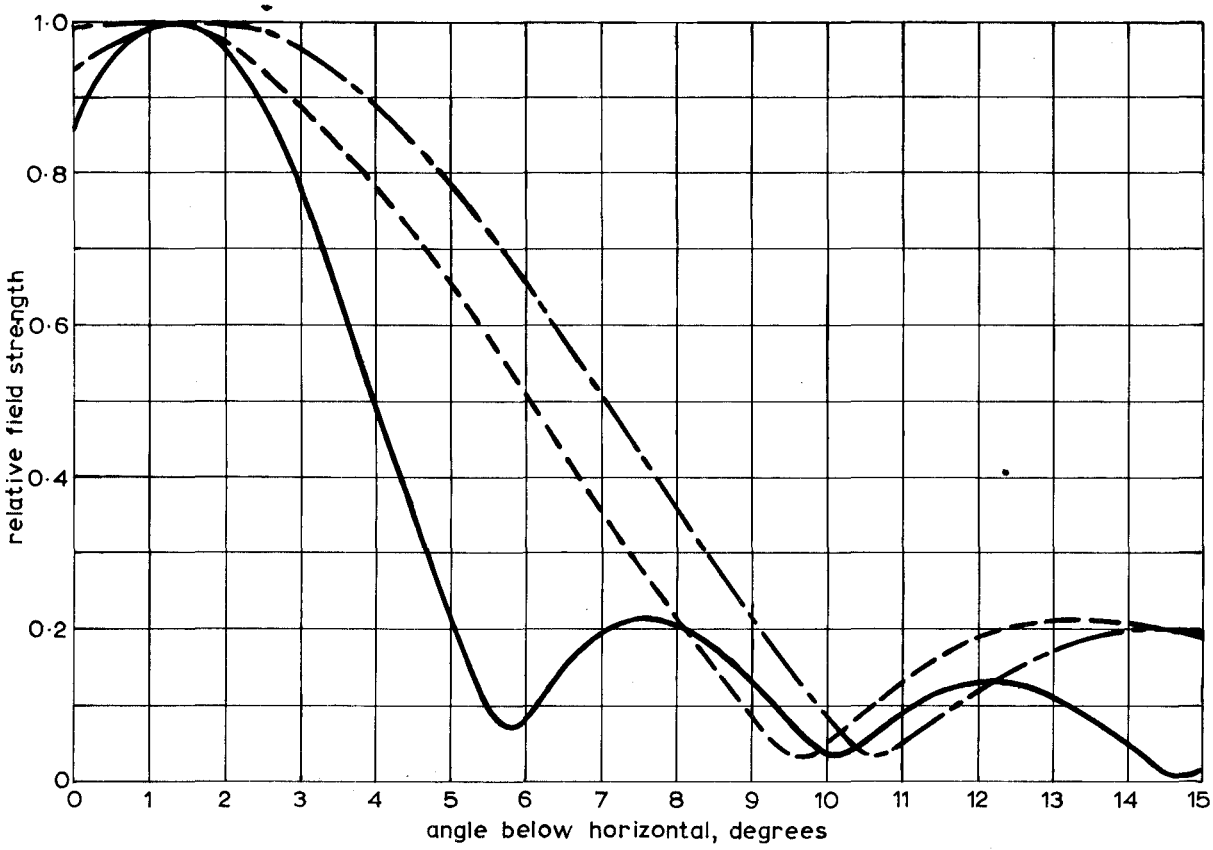


Fig.5 Vertical radiation patterns

Whole aerial
Lower half-aerial
Upper half-aerial

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