RESEARCH DEPARTMENT

Transmitting aerials for the Haverfordwest v.h.f. television and v.h.f. sound station

TECHNOLOGICAL REPORT No. E-102

1964/22

THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION

RESEARCH DEPARTMENT

TRANSMITTING AERIALS FOR THE HAVERFORDWEST V.H.F. TELEVISION AND V.H.F. SOUND STATION

Technological Report No. E-102
(1964/22)

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April, 1964

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INTRODUCTION

The Haverfordwest relay station came into operation on 17th February 1964. It provides a television and v.h.f. sound service to West Pembrokeshire, the main towns in the service area being Milford Haven, Pembroke and Pembroke Dock, Haverfordwest, Tenby and St. David's.

SUMMARY OF INSTALLATION

Site: The site is at Woodstock, about 8 miles (12·8 km) north-east of Haverfordwest, grid reference SN/029262, height 620 ft (189 m) a.m.s.l.

Support Structure: The support structure consists of a 507 ft (155 m) stayed mast of 4 ft (1·22 m) square cross section. The mast is oriented with one stay on a bearing of 45° ETN.

General Arrangement: See Fig. 1.

Band I

Channel: Channel 4, with horizontal polarization, is used. Both vision and sound carriers are offset -16·875 kc/s.

Aerial: The aerial consists of six tiers of tangential $\lambda/2$ dipoles mounted on a 6 ft 6 in (1·98 m) diameter cylinder. The inter-tier spacing is $0{\cdot}65\lambda$ and the mean height 441 ft (134 m) a.g.l. All tiers have a dipole on a bearing of 279° ETN spaced 8 ft (2·44 m) from the cylinder axis. Tiers 1, 2, 5 and 6 have additional dipoles on bearings of 77° ETN spaced 9 ft 6 in (2·9 m) from the cylinder axis, and 208° ETN spaced 8 ft (2·44 m) from the cylinder axis. All dipoles are fed with equal co-phased currents. There are independent main feeders to each three-tier half-aerial.

Power:	Four 500 watt transmitters are used.		
Templet:	See Fig. 2.		
Measured Horizontal Radiation Pattern (h.r.p.)	See Fig. 4 and Notes 1 and 2.		
Gain:	Mean intrinsic gain		5·3 dB
	Deduct: losses due to distribution feeders and possible misalignment		0·3 dB
	Mean net gain		5·0 dB
	Deduct: loss in main feeder (type HM11)	1·1 dB	
	network loss	0·6 dB	1·7 dB
	Mean effective gain		3·3 dB

Band II

Carrier Frequencies:	89·3 (Light), 91·5 (Third), 93·7 (Welsh Home) Mc/s.		
Aerial:	The aerial consists of six tiers of tangential $\lambda/2$ dipoles mounted on a 6 ft 6 in (1·98 m) diameter cylinder. The inter-tier spacing is $0{\cdot}65\lambda$ and the mean height 231 ft (70 m) a.g.l. All tiers have dipoles on bearings of 145° and 235° ETN; tiers 1 and 6 have additional dipoles on bearings of 55° and 325° ETN. All dipoles are spaced 6 ft (1·83 m) from the cylinder axis and are fed with equal co-phased currents. There are independent main feeders to each three-tier half-aerial.		
Power:	Two 1 kW amplifiers, under-run at 0·85 kW each, are used for each programme.		
Templet:	See Fig. 5.		
Measured h.r.p.:	See Fig. 7 and Note 1.		
Gain:	Mean intrinsic gain		5·9 dB
	Deduct: losses due to distribution feeders and possible misalignment		0·3 dB
	Mean net gain		5·6 dB
	Deduct: loss in main feeder (type HM11)	0·8 dB	
	network loss	0·9 dB	1·7 dB
	Mean effective gain		3·9 dB

Programme Links: The television programme is obtained by means of a GPO microwave link. The Light and Third v.h.f. sound programmes are obtained by direct pick-up of the transmissions from Blaen-Plwyf; the Welsh Home programme is obtained by direct pick-up of the transmission from Wenvoe. The receiving aerials are mounted on a 64 ft (19·5 m) self-supporting tower.

Notes: Band I

1. The preliminary aerial design was based on a theoretical prediction of the h.r.p. (see Fig. 3) in which re-radiation from the dipole support booms was neglected. The measured h.r.p. of a small-scale model differed from the theoretical h.r.p. but an acceptable fit to the templet (see Fig. 4) was obtained by modifying the spacings of the dipoles and rotating the h.r.p. 4° in a clockwise direction.

2. In view of the exacting templet and of the use of dissimilar tiers, radiating current measurements and adjustments were carried out on the full-scale aerial. The currents achieved are such that the effective radiated power (e.r.p.) is within ± 1 dB of that shown in Fig. 4 except over the arc 60° - 110° ETN. In this region, because of the deep minimum in the h.r.p., the deviation in e.r.p. is greater, but the maximum transgression of the 0·3 kW Sutton Coldfield restriction is estimated to be only about 2 dB.

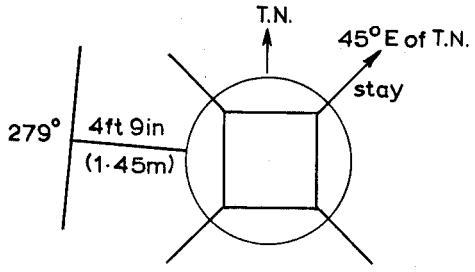
Band II

1. The preliminary aerial design was based on a theoretical prediction of the h.r.p. (see Fig. 6) in which re-radiation from the dipole support booms was neglected. The measured h.r.p. of a small-scale model differed from the theoretical h.r.p. but gave an acceptable fit (see Fig. 7) to the templet.

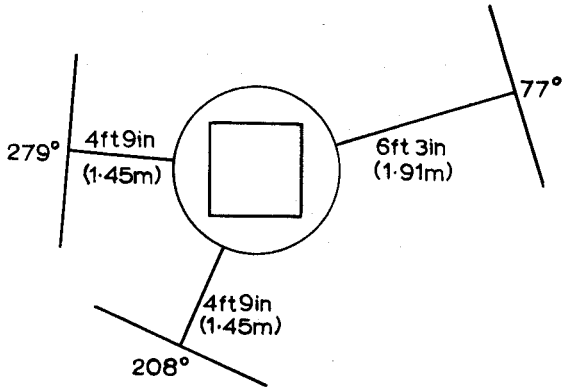
ACKNOWLEDGEMENTS

The theoretical and experimental work involved in the basic design of both Band I and II aerials was carried out by Mr. A. Brown. Mr. R.D.C. Thoday was responsible for checking that the ratios of the dipole currents on the full-scale Band I aerial were within the tolerances appropriate for the required h.r.p.

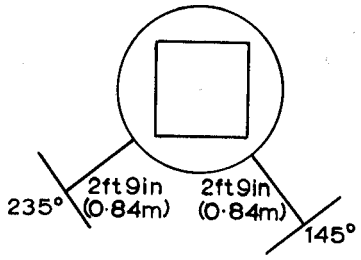
ALG



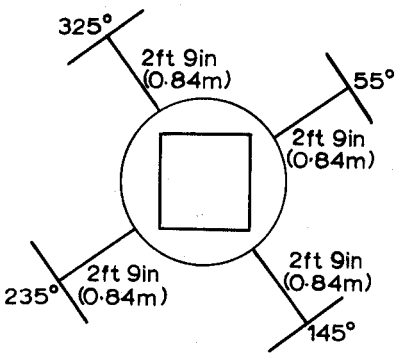
Plan of tiers 3 and 4 of Band I aerial



Plan of tiers 1, 2, 5 and 6 of Band I aerial



Plan of tiers 2, 3, 4 and 5 of Band II aerial



Plan of tiers 1 and 6 of Band II aerial

Note :- All bearings are E of T.N.

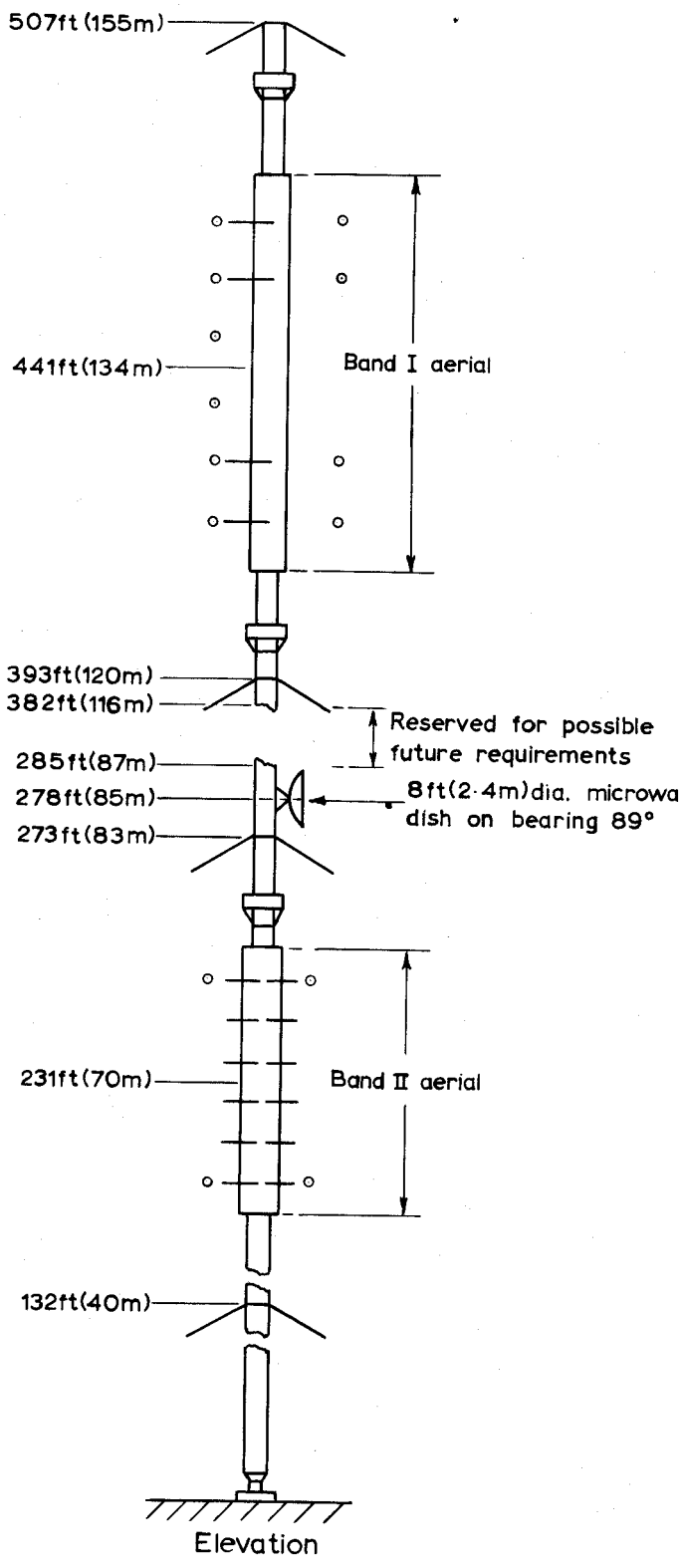


Fig. 1 General arrangement of aerials on mast

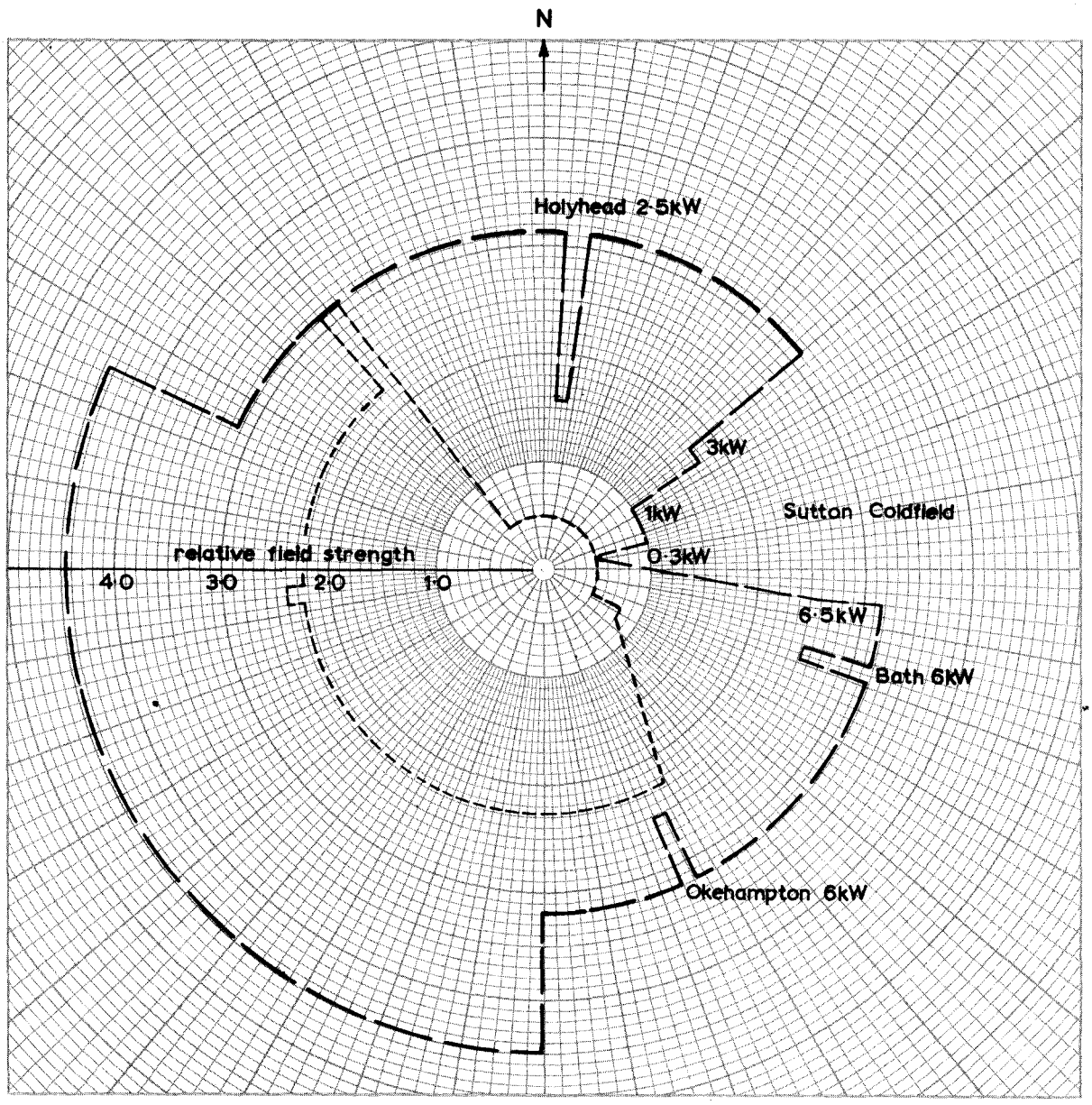


Fig. 2 Templet for Band I aerial

HORIZONTAL POLARIZATION

Channel 4 (Vision carrier 61·75Mc/s, Sound carrier 58·25Mc/s)

——— Maximum permissible E.R.P.

- - - - - Minimum desirable E.R.P.

Unit field corresponds to an E.R.P. of 1kW

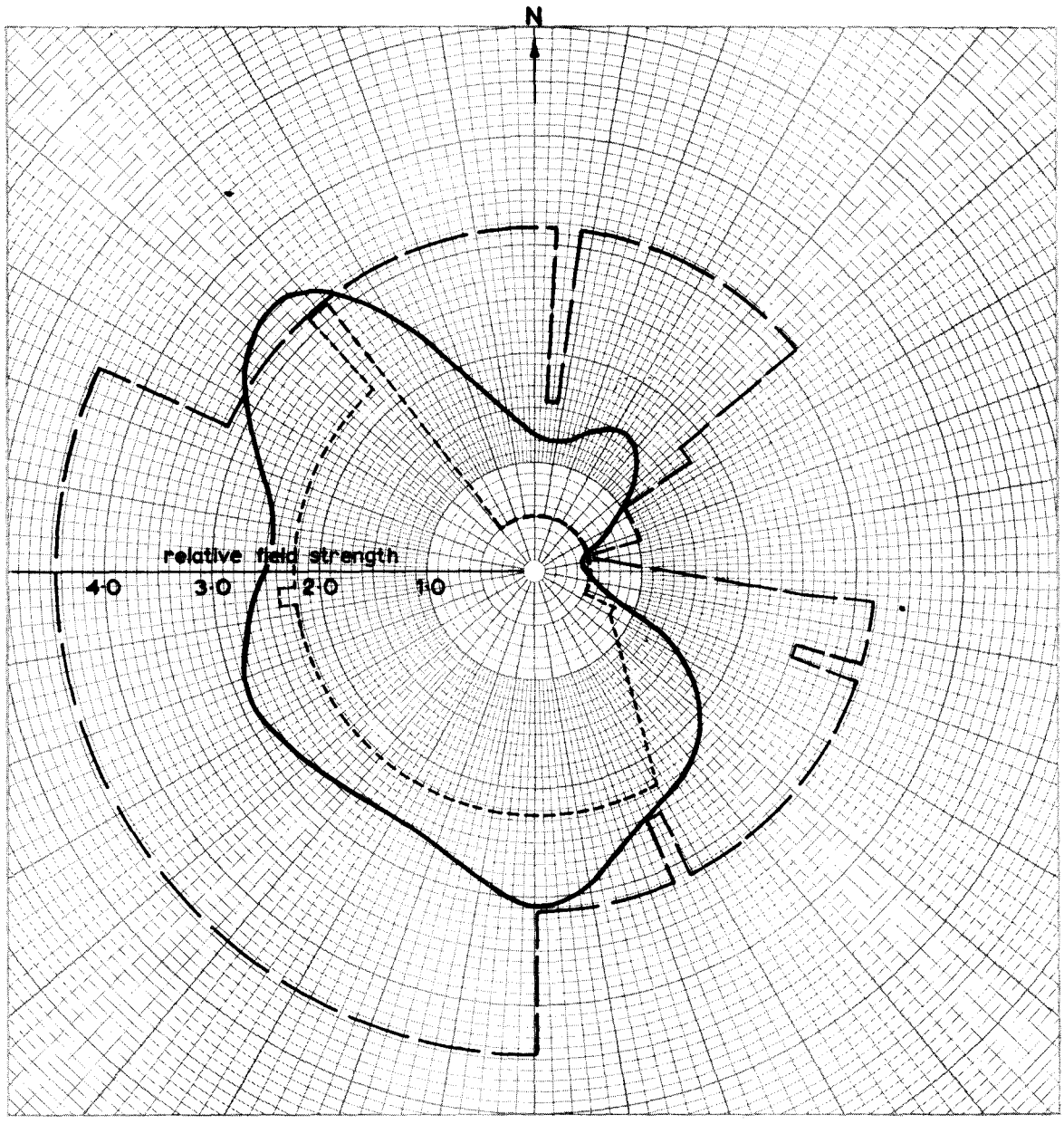


Fig. 3 Theoretical h.r.p. of Band I aerial

HORIZONTAL POLARIZATION

Channel 4 (Vision carrier 61·75Mc/s, Sound carrier 58·25Mc/s)

Mean effective gain 3·9dB —— —— Maximum permissible E.R.P.

Transmitter power 4 x 0·5kW ------- Minimum desirable E.R.P

Mean E.R.P. 5·0kW

Unit field corresponds to an E.R.P. of 1kW

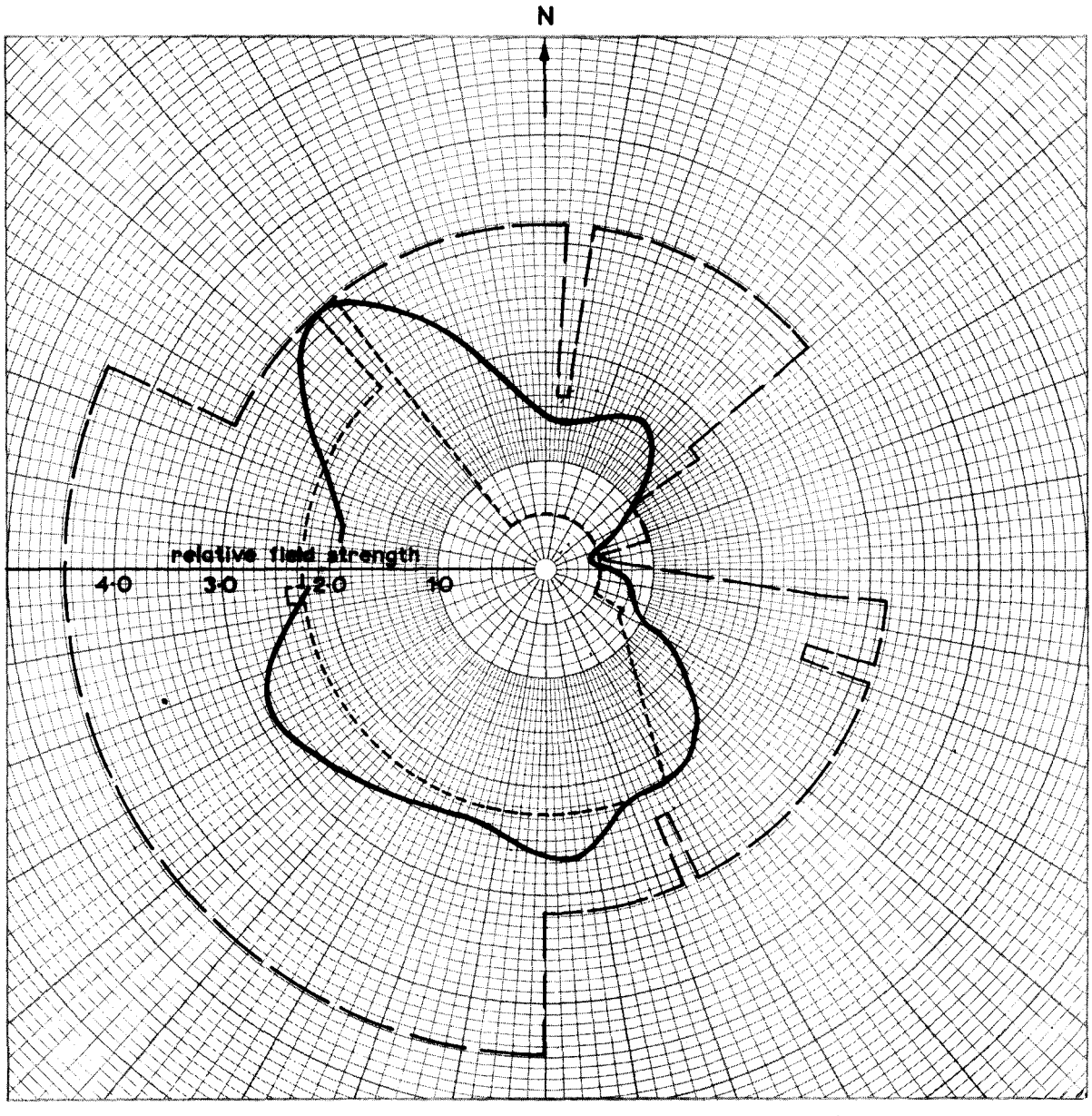


Fig.4 Measured h.r.p. of Band I aerial

HORIZONTAL POLARIZATION

Channel 4 (Vision carrier 61·75Mc/s, Sound carrier 58·25Mc/s

Mean effective gain 3·3dB —— —— Maximum permissible E.R.P.

Transmitter power 4x0·5kW ------ Minimum desirable E.R.P.

Mean E.R.P. 4·3kW

Unit field corresponds to an E.R.P. of 1kW

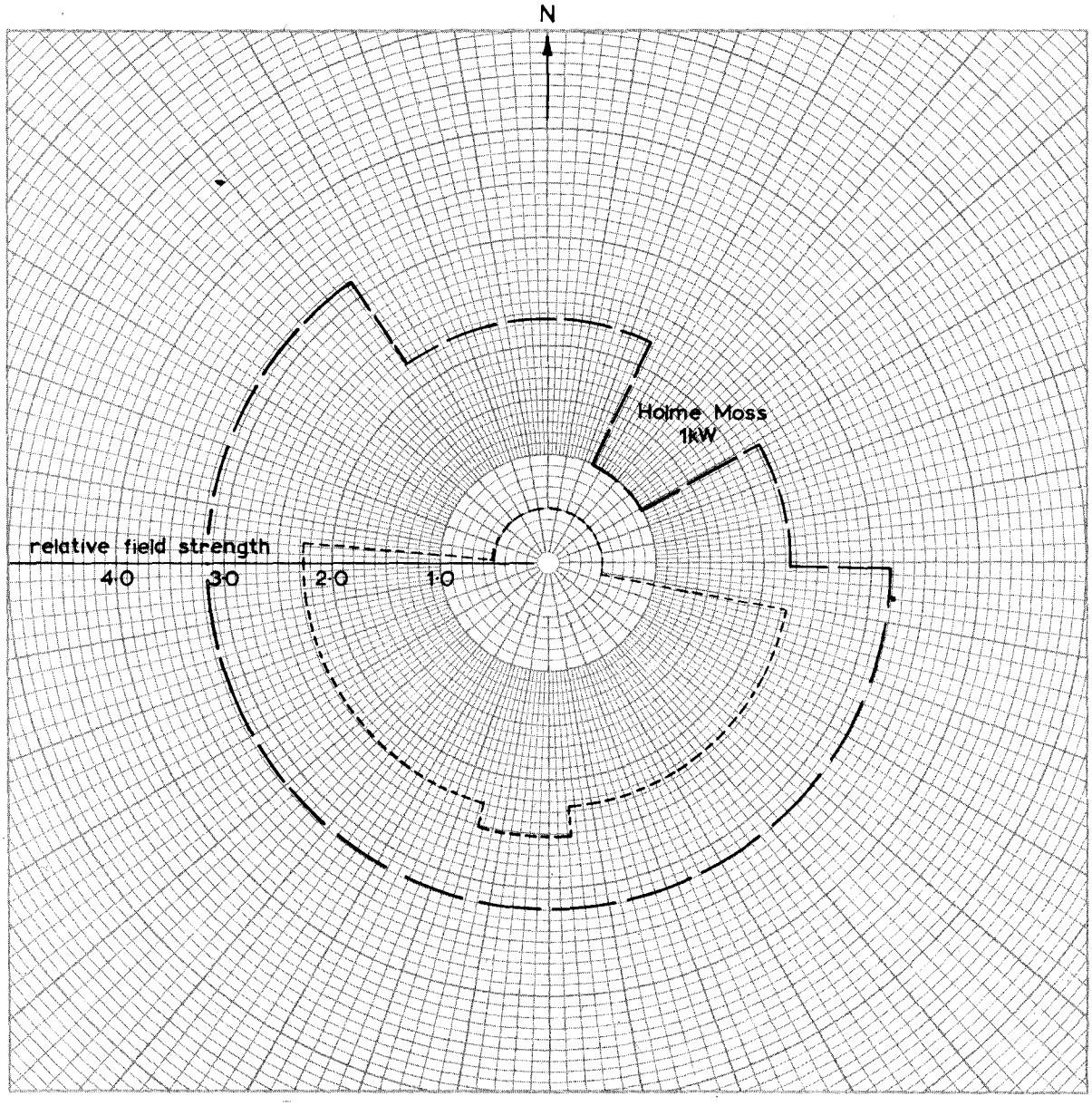


Fig. 5 Templet for Band II aerial

HORIZONTAL POLARIZATION

89·3 (Light), 91·5 (Third), 93·7 (Welsh Home), Mc/s

—— —— Maximum permissible E.R.P.

- - - - - - - Minimum desirable E.R.P.

Unit field corresponds to an E.R.P. of 1kW

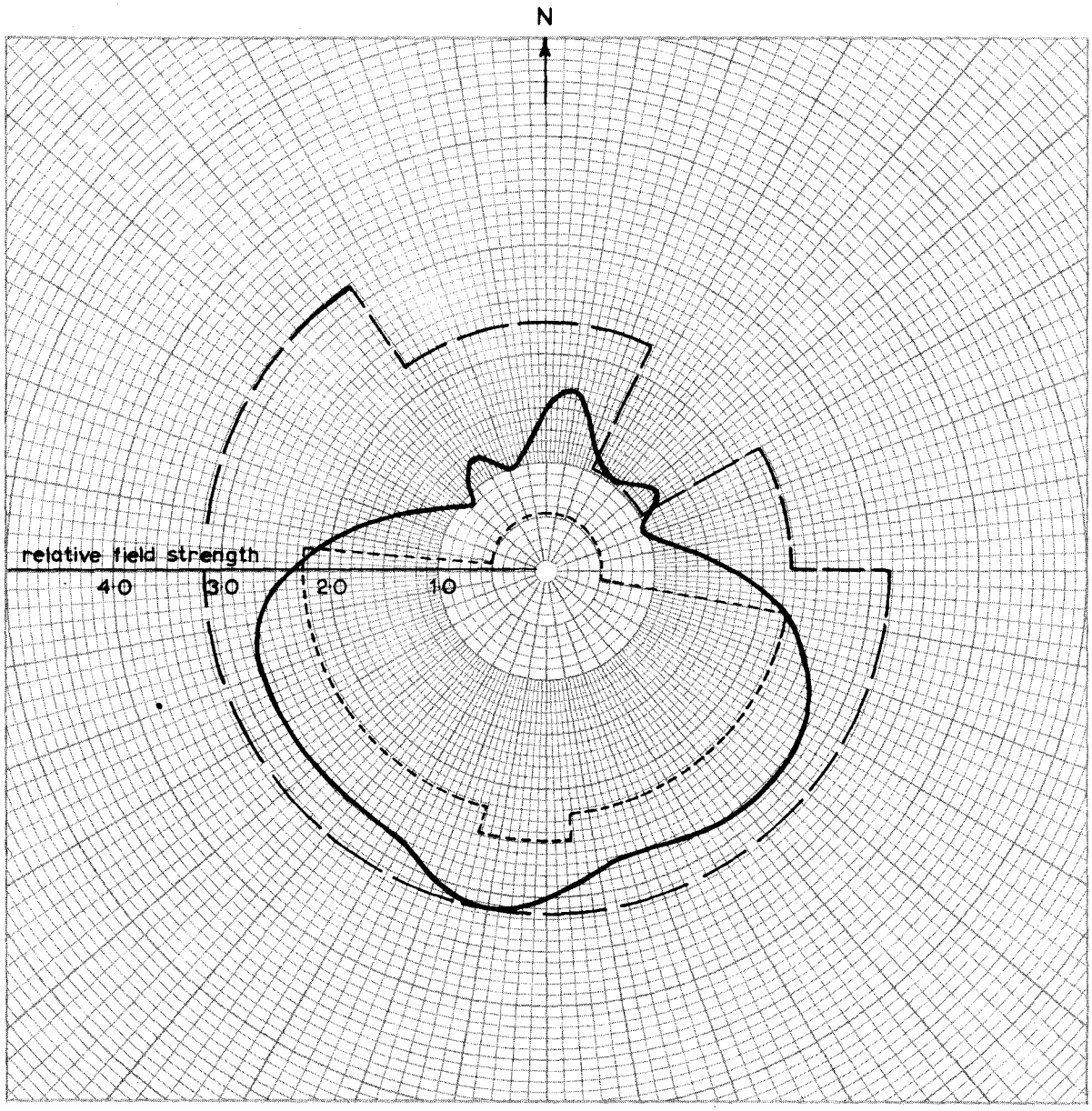


Fig. 6 Theoretical h.r.p. of Band II aerial

HORIZONTAL POLARIZATION

89·3 (Light), 91·5 (Third), 93·7 (Welsh Home) Mc/s

Mean effective gain 3·7dB — — Maximum permissible E.R.P.

Transmitter power 2x1kW - - - - - - Minimum desirable E.R.P.

Mean E.R.P. 4·7kW

Unit field corresponds to an E.R.P. of 1kW

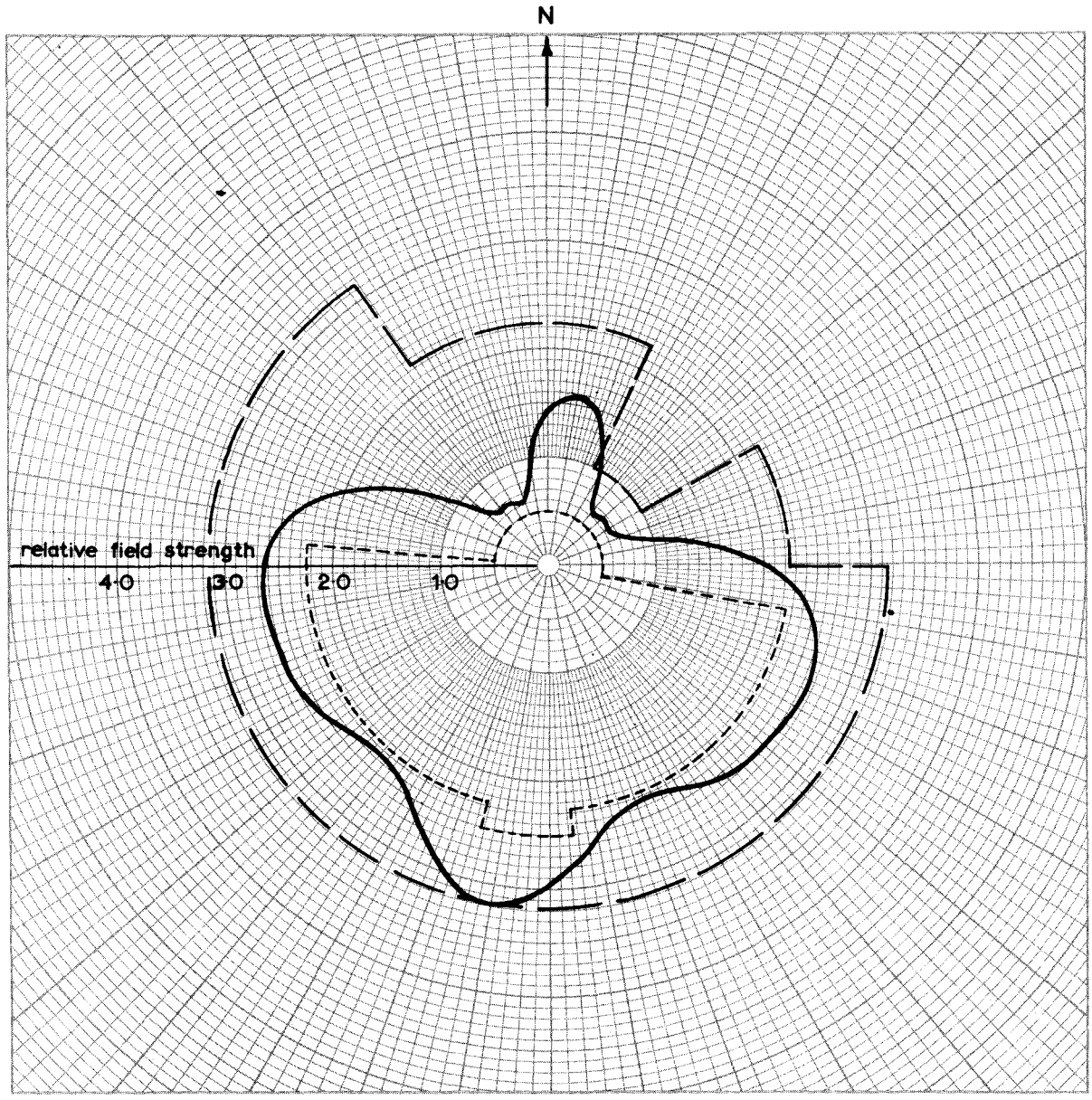


Fig. 7 Measured h.r.p. of Band II aerial

HORIZONTAL POLARIZATION

89·3 (Light), 91·5 (Third), 93·7(Welsh Home),Mc/s

Mean effective gain 3·9dB ——— Maximum permissible E.R.P.

Transmitter power 2x0·85kW - - - - - Minimum desirable E.R.P.

Mean E.R.P. 4·2kW

Unit field corresponds to an E.R.P. of 1kW

Printed by BBC Research Department, Kingswood Warren, Tadworth, Surrey