

RESEARCH DEPARTMENT

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

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

INTRODUCTION

The Churchdown relay station came into operation on 29th November 1965. It provides a television and v.h.f. sound service to the towns of Cheltenham and Gloucester only.

SUMMARY OF INSTALLATION

<u>Site:</u>	The site is on Churchdown Hill about 3 miles (4.8 kms) north-east of Gloucester, grid reference SO 880189, height 480 ft (147 m) a.m.s.l.		
<u>Support Structure:</u>	The support structure consists of a 78 ft (24 m) self-supporting tower oriented with one face on a bearing of 74° ETN. The overall height is increased to 98 ft (30 m) by a topmast used to support the receiving and transmitting aerials of another user (Water Board) who is sharing the mast facility.		
<u>General Arrangement:</u>	See Fig. 1.		
<u>Band I</u>			
Channel:	Channel 1 with horizontal polarization is used. Vision and sound carriers are offset -16.875 kc/s.		
Aerial:	The aerial ¹ consists of an array of four 3-element horizontal Yagis arranged in three tiers spaced 0.5λ apart and having a mean height of 67 ft (20 m) a.g.l. Tiers 1 and 3 each have a Yagi on a radial bearing of 60° ETN with the driven element spaced 0.5λ from the tower axis. Tier 2 has two broadside Yagis spaced 0.8λ apart and aligned on a bearing of 254° ETN with the driven elements spaced 0.1λ from the plane parallel to the elements through the tower axis. All Yagis are fed with equal co-phased currents.		
Power:	A single 100 watt translator-amplifier is used.		
Templet and horizontal radiation pattern (h.r.p.):	See Fig. 3 and Note 1.		
Gain:	Mean intrinsic gain		0.1 dB
	<u>Deduct:</u> loss due to distribution feeder and possible misalignment		<u>0.1 dB</u>
	Mean net gain		0 dB
	<u>Deduct:</u> loss in main feeder (type RPC 2603)	0.9 dB	
	network loss	<u>0.6 dB</u>	<u>1.5 dB</u>
			<u>-1.5 dB</u>

Band II

Carrier Frequencies:	89.0 (Light), 91.2 (Third) and 93.4 (Home) Mc/s.		
Aerial:	The aerial ¹ consists of two tiers spaced 0.5λ apart with a mean height of 42 ft (12.8 m) a.g.l. Each tier has two 4-element Yagis aligned on bearings of 68° and 248° ETN with the driven elements spaced 0.875λ from the tower axis. All Yagis are fed with equal co-phased currents.		
Power:	A 10 watt translator is used for each programme.		
Templet and h.r.p.:	See Fig. 4 and Note 2.		
Gain:	Mean intrinsic gain		2.0 dB
	<u>Deduct:</u> loss due to distribution feeder and possible misalignment		<u>0.2 dB</u>
	Mean net gain		1.8 dB
	<u>Deduct:</u> loss in main feeder (type RPC 2603)	0.9 dB	
	network loss	<u>0.9 dB</u>	<u>1.8 dB</u>
Mean effective gain		<u>0 dB</u>	

Programme Sources: Both television and v.h.f. sound programmes are obtained by direct pick-up of the transmissions from Sutton Coldfield.

- Notes:
1. The preliminary aerial design was based on a theoretical prediction of the of the h.r.p. (see Fig. 2), the effects of coupling between Yagis and re-radiation from the support structure being neglected. To reduce the re-radiation effects to a minimum the two Yagis in the middle tier of the aerial are supported on horizontal glass-fibre tubes. In view of the stringent templet requirements small-scale model measurements were made to determine the actual h.r.p., which is shown in Fig. 3.
 2. Fig. 4 shows the theoretical h.r.p. of the aerial. Confirmatory model measurements were considered unnecessary in view of the relative simplicity of the templet and aerial.

REFERENCE

1. Detailed information on the construction and dimensions of the aerials is given on the following drawings held by BBC Planning and Installation Department.

P.I.D. 9068.2.1A.	General Arrangement of Aerials on Tower
P.I.D. SK.19119.J.	Arrangement of Band I Transmitting Aerial on Tower
P.I.D. 8732.2.5H.	Band II Transmitting and Receiving Aerial
P.I.D. 8732.2.4H.	Band I Receiving Aerial

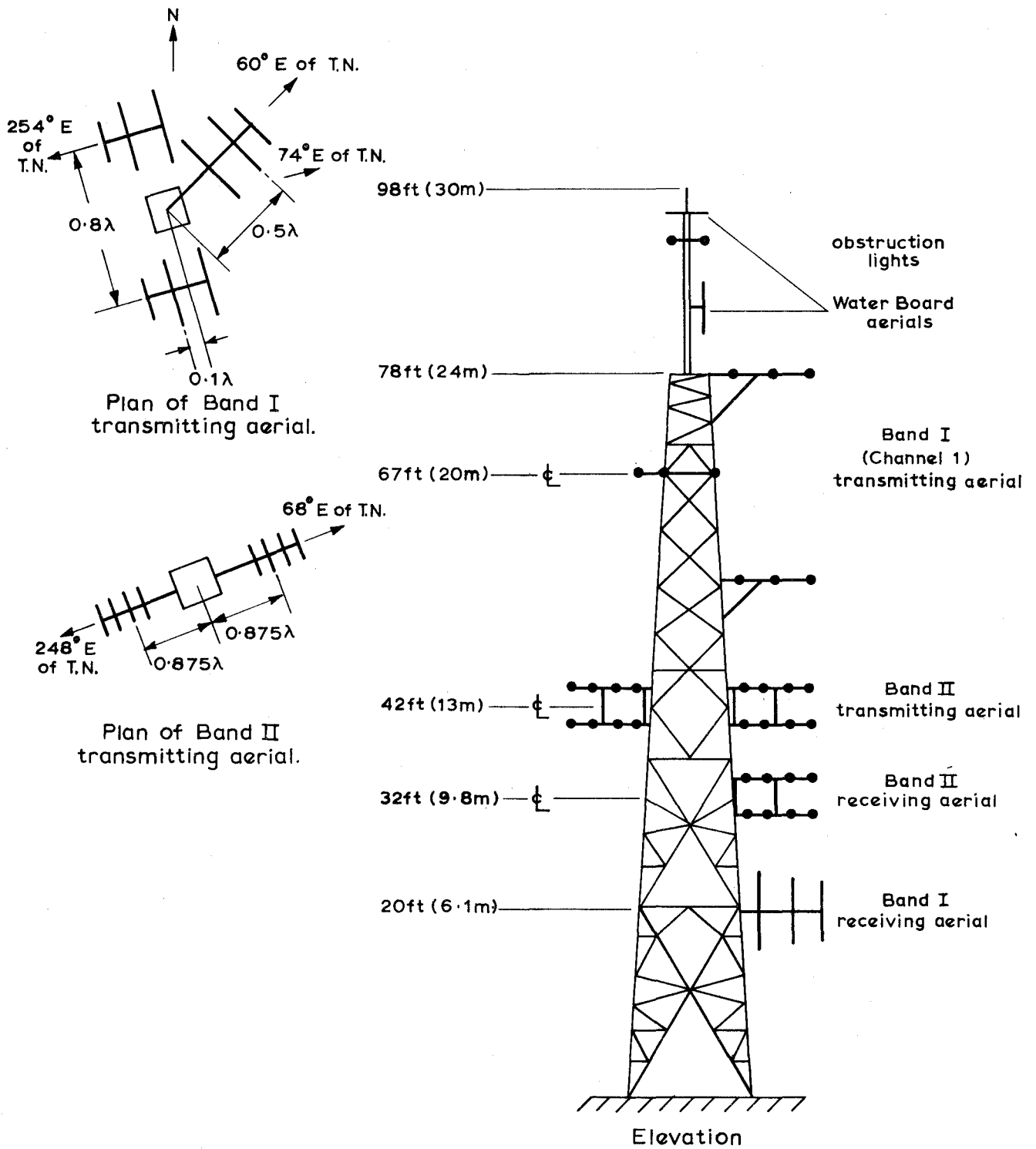


Fig.1. General arrangement of aerials on tower.

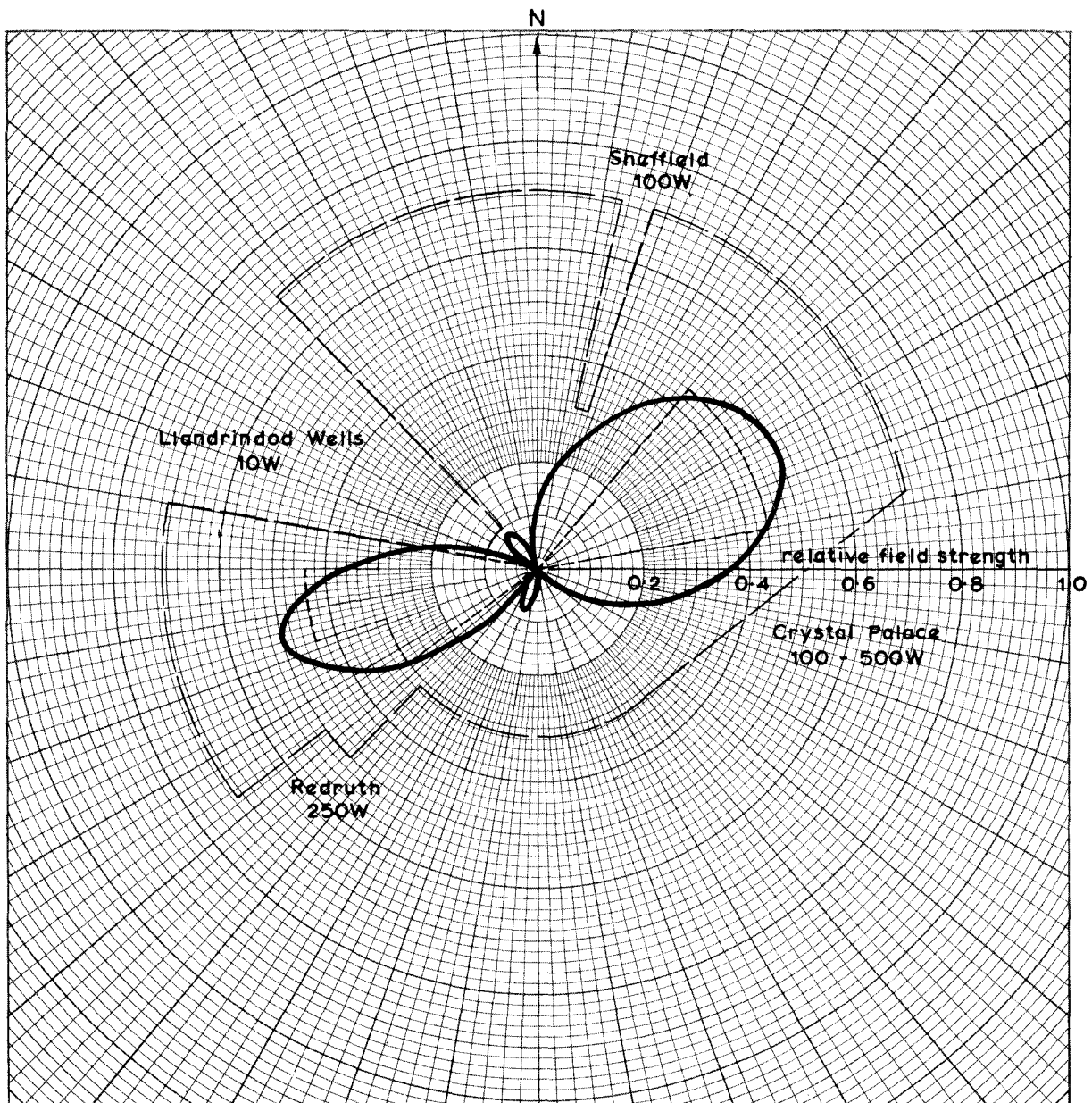


Fig. 2. Band I templet and theoretical horizontal radiation pattern.

HORIZONTAL POLARIZATION

Channel 1 (Vision carrier 45.0Mc/s, Sound carrier 41.5Mc/s)

Mean effective gain: -1.7dB ——— Maximum permissible E.R.P.

Transmitter power: 100W - - - - - Minimum desirable E.R.P.

Mean E.R.P.: 68W

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

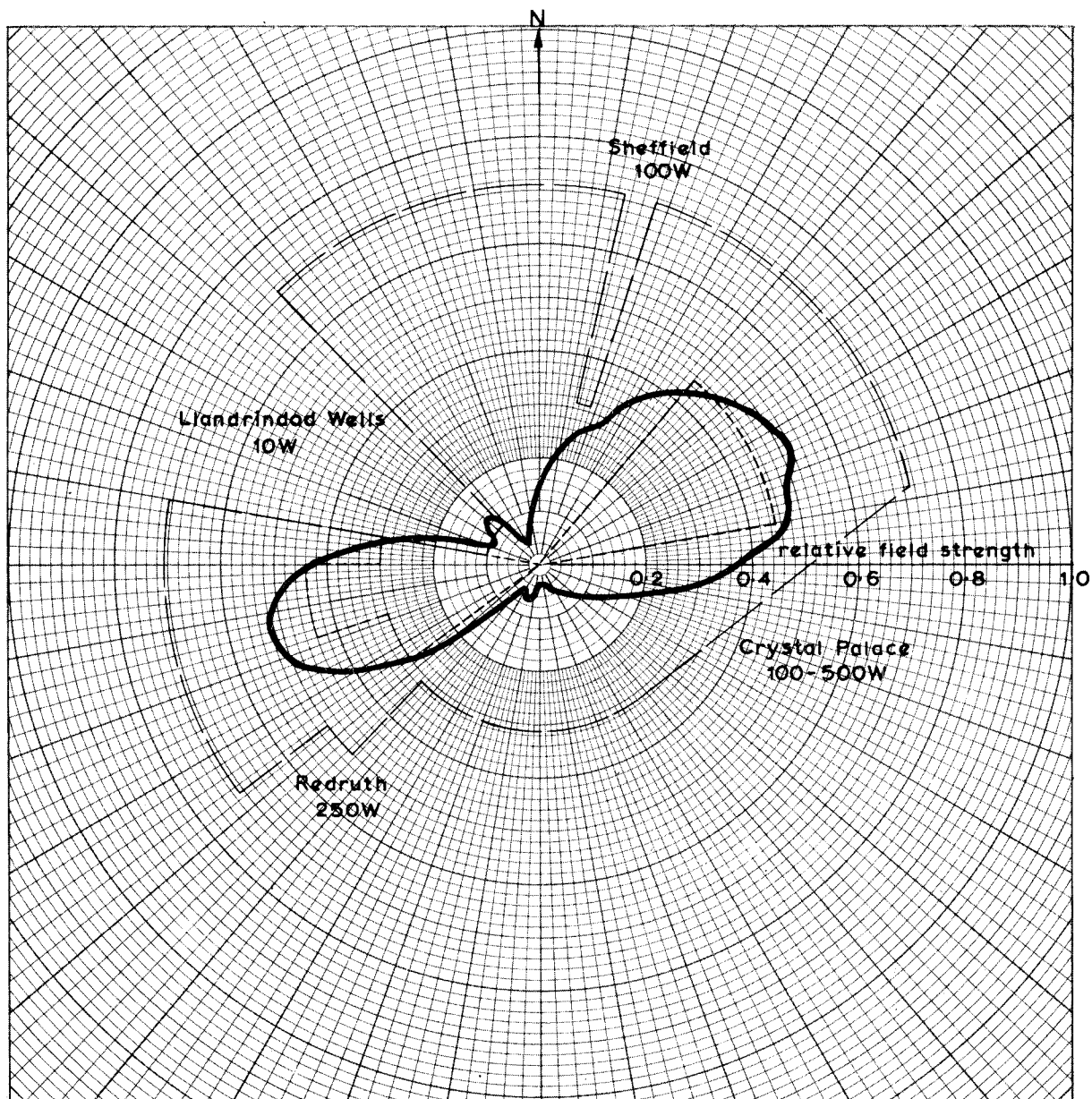


Fig. 3. Band I templet and measured horizontal radiation pattern.

HORIZONTAL POLARIZATION

Channel 1 (Vision carrier 45.0Mc/s, Sound carrier 41.5Mc/s)

Mean effective gain: -1.5dB

Transmitter power: 100W

Mean E.R.P.: 71W

——— Maximum permissible E.R.P.

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

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

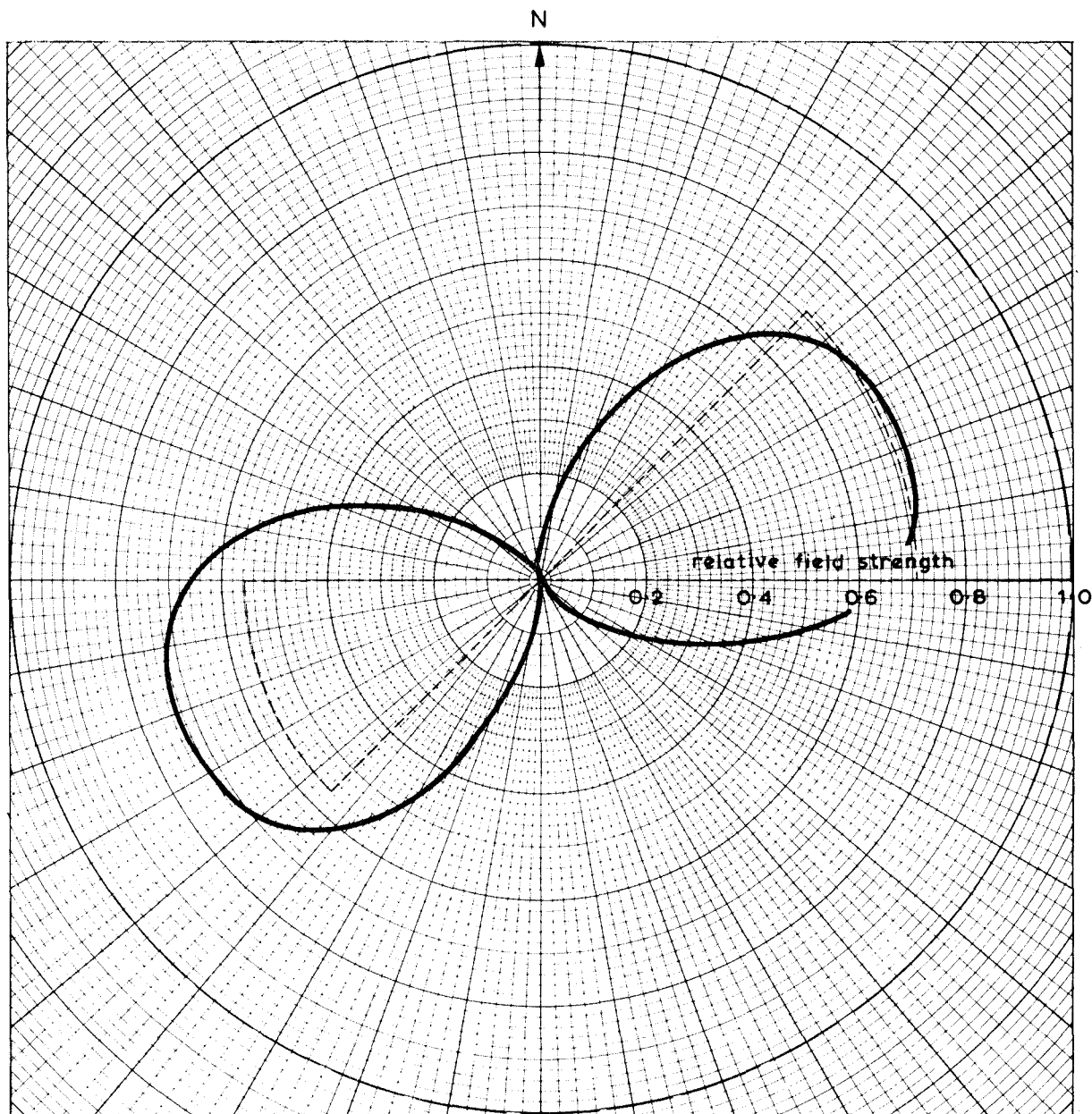


Fig. 4. Band II templet and theoretical horizontal radiation pattern.

HORIZONTAL POLARIZATION

89.0 (Light), 91.2 (Third), 93.4 (Home), Mc/s

Mean effective gain: 0dB

Transmitter power: 10W

Mean E.R.P.: 10W

————— Maximum permissible E.R.P.

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

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