



RESEARCH DEPARTMENT

New Band I transmitting aerial for the Sutton Coldfield television station

TECHNOLOGICAL REPORT No. E - 112

1964/80

**THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION**

RESEARCH DEPARTMENT

**NEW BAND I TRANSMITTING AERIAL
FOR THE SUTTON COLDFIELD TELEVISION STATION**

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(1964/80)

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**NEW BAND I TRANSMITTING AERIAL
FOR THE SUTTON COLDFIELD TELEVISION STATION**

INTRODUCTION

A new Band I aerial has been built on the column of the existing mast at Sutton Coldfield in order to permit the erection of a u.h.f. aerial on a top mast. The new aerial came into service on 23rd October 1964.

SUMMARY OF INSTALLATION

- Site: The site is 8 miles (13 km) north-east of Birmingham, grid reference SK/113003, height 555 ft (169 m) a.m.s.l.
- Support Structure: The support structure consists of a 715 ft (218 m) stayed mast. Up to a height of 610 ft (185 m) the mast is of triangular cross-section with a side of 9 ft (2.75 m); above this height the cross-section is circular with a diameter of 6 ft 6 in (2 m). The mast is provided with three sets of stays, on bearings of 0°, 120° and 240° E.T.N.
- General Arrangement: See Fig. 1.
- Channel: Channel 4, with vertical polarization is used. Vision and sound carriers are not offset.
- Aerial: The aerial, which is shown in Fig. 2, comprises two tiers each of six dipoles fed with equal cophased currents. The dipoles are spaced 0.25λ from the cylinder and the inter-tier spacing is 0.94λ . The mean height of the aerial is 702 ft 6½ in (214 m), i.e. 34 ft 9½ in (10.6 m) lower than the original aerial.
- The aerial is fed with a single 5 in (127 mm) diameter copper feeder.
- Reserve Aerial: The reserve aerial, consisting of two tiers of three dipoles at a mean height of 470 ft (143 m), is unchanged.

Power: A single 55 kW transmitter is used. The reserve transmitter has a power of 5 kW.

Templet and Horizontal Radiation Pattern (h.r.p.) Fig. 3 shows the templet and the h.r.p. of the original aerial. If no mast stays were present, the new aerial would be omnidirectional to within ± 0.2 dB (Fig. 4). The effect of the mast stays is to give the h.r.p. shown in Fig. 5 and results in too large a variation compared with the original aerial. Accordingly, additional scattering conductors were fitted mid-way between the mast stays; the resulting h.r.p., which is that adopted, is compared with the original h.r.p. and the templet in Fig. 6 (see Note).

Vertical Radiation Pattern (v.r.p.) As the aerial comprises only two tiers, no gapfilling of the v.r.p. is required.

Gain:

Mean intrinsic gain		2.8 dB
<u>Deduct:</u> loss in distribution feeders		<u>0.1 dB</u>
Mean net gain		2.7 dB
<u>Deduct:</u> loss in main feeder (Type Marconi 5 inch dia.) rigid copper	0.6 dB	
Network loss	<u>0.1 dB</u>	<u>0.7 dB</u>
Mean effective gain		<u><u>2.0 dB</u></u>

Programme Link: The programme is obtained by G.P.O. line.

Note: The basic design of the aerial was based on measurements on a one-tenth scale model of the whole aerial complete with stays.

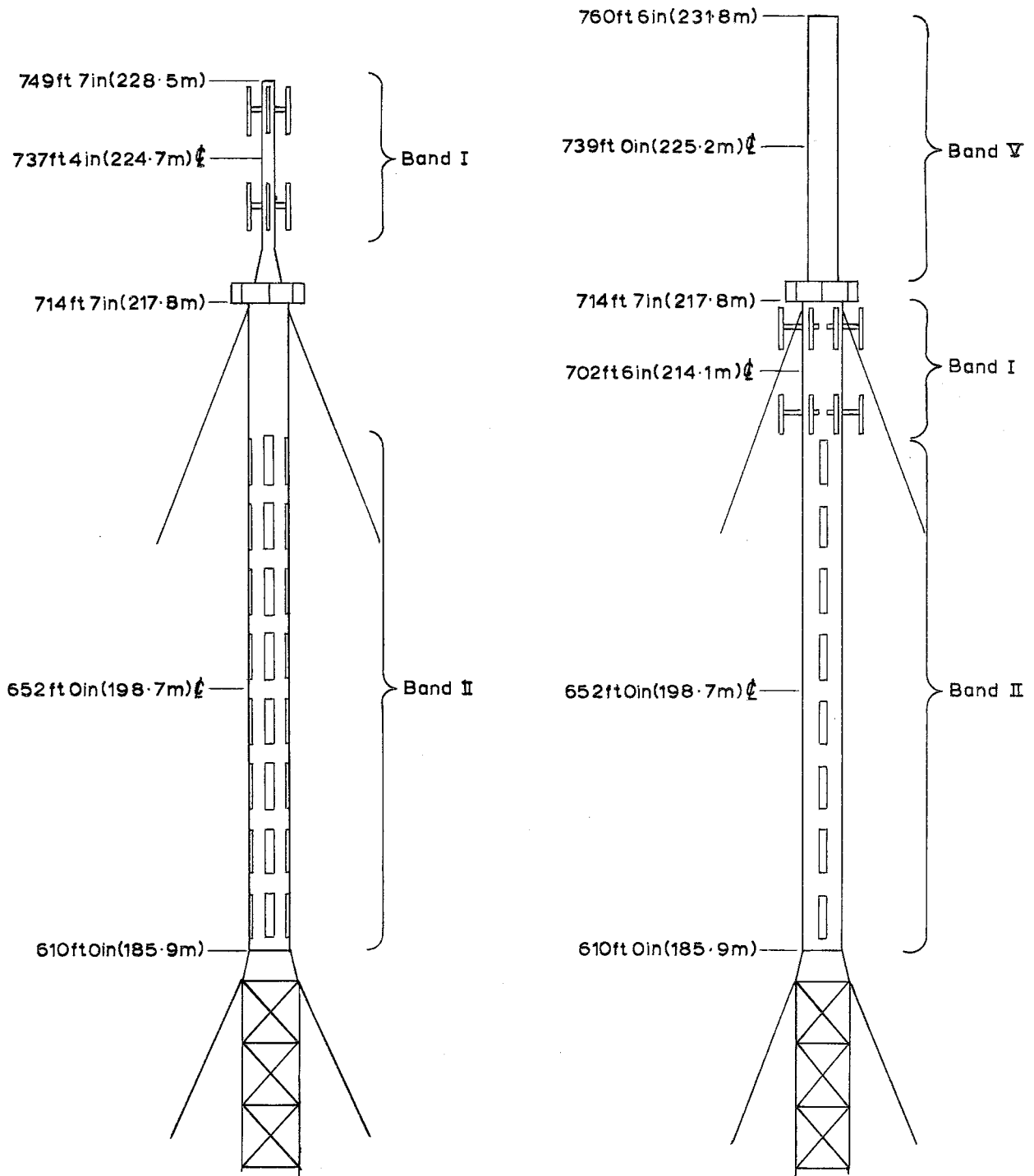
ACKNOWLEDGMENT

The mechanical design, construction and setting to work of the aerial were carried out by Planning and Installation Department.

REFERENCE

Detailed information on the construction and dimensions of the aerial is given on the following drawings held by BBC Planning and Installation Department:

P.I.D. SK. 15907H Transmitting dipoles
P.I.D. SK. 15922 Scattering elements



(a) Original arrangement

(b) New arrangement

Fig.1 General arrangement of airtel poles on mast

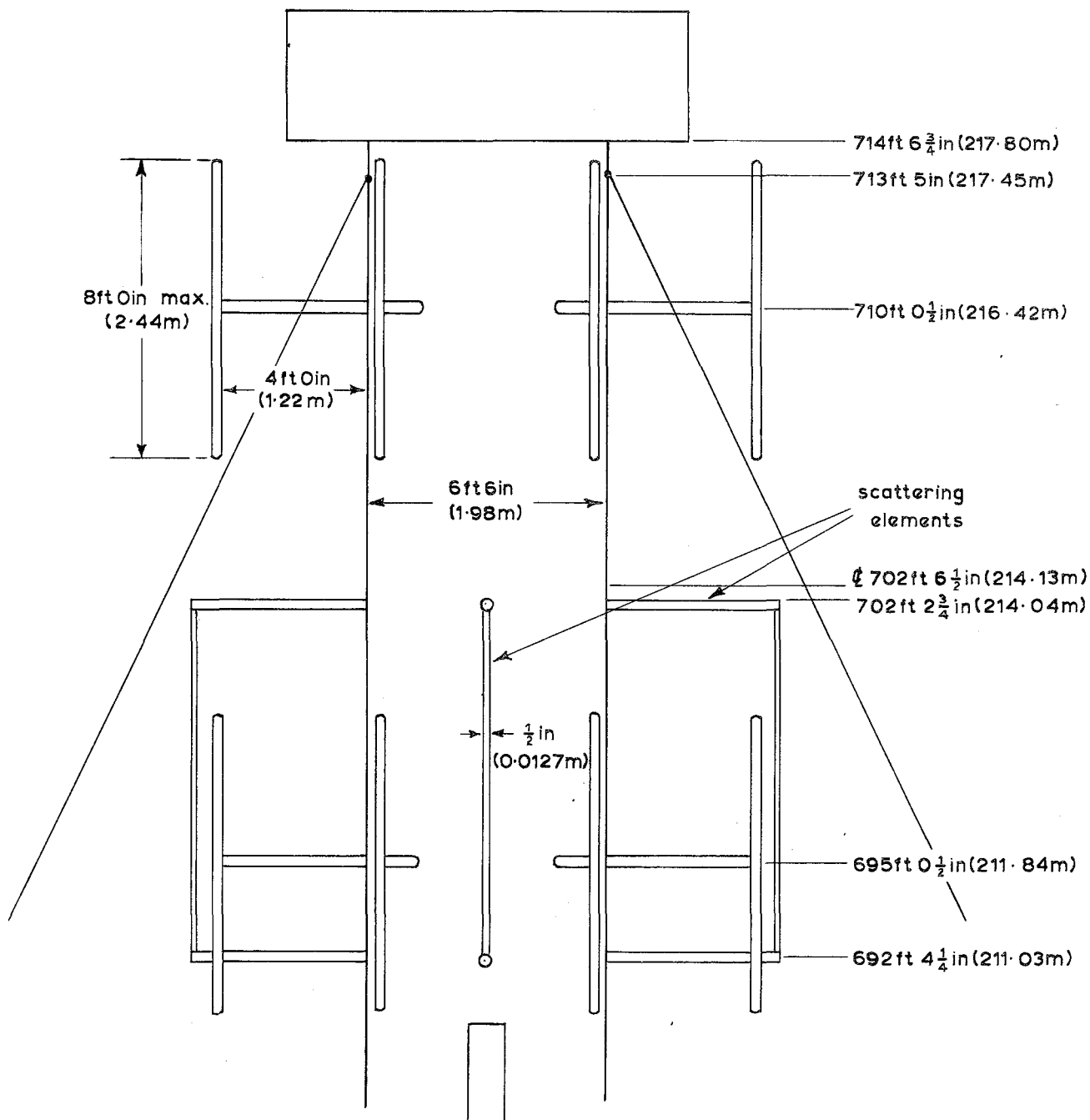


Fig. 2(a) Arrangement of new Band I aerial - elevation

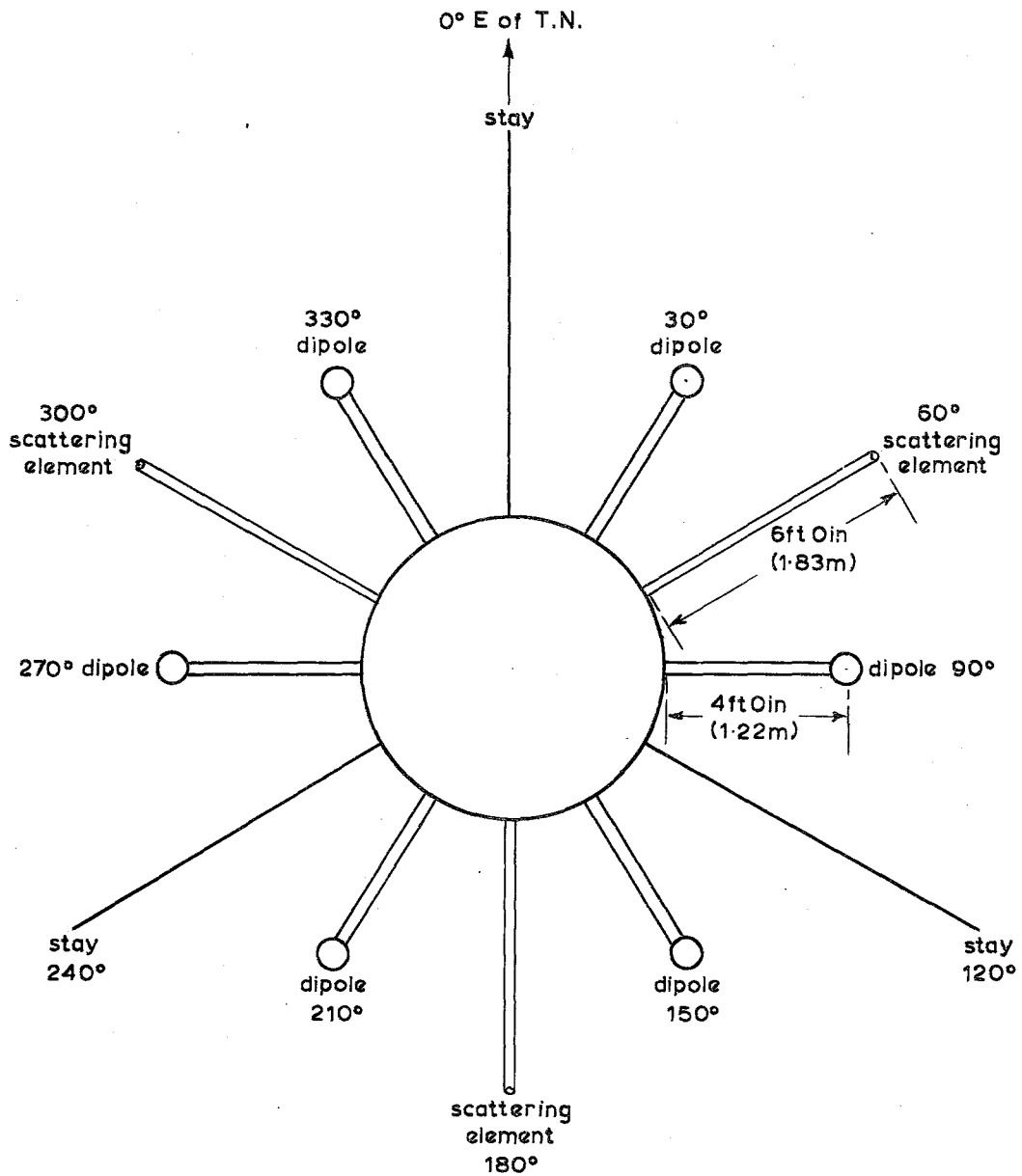


Fig.2(b) Arrangement of new Band I aerial — plan

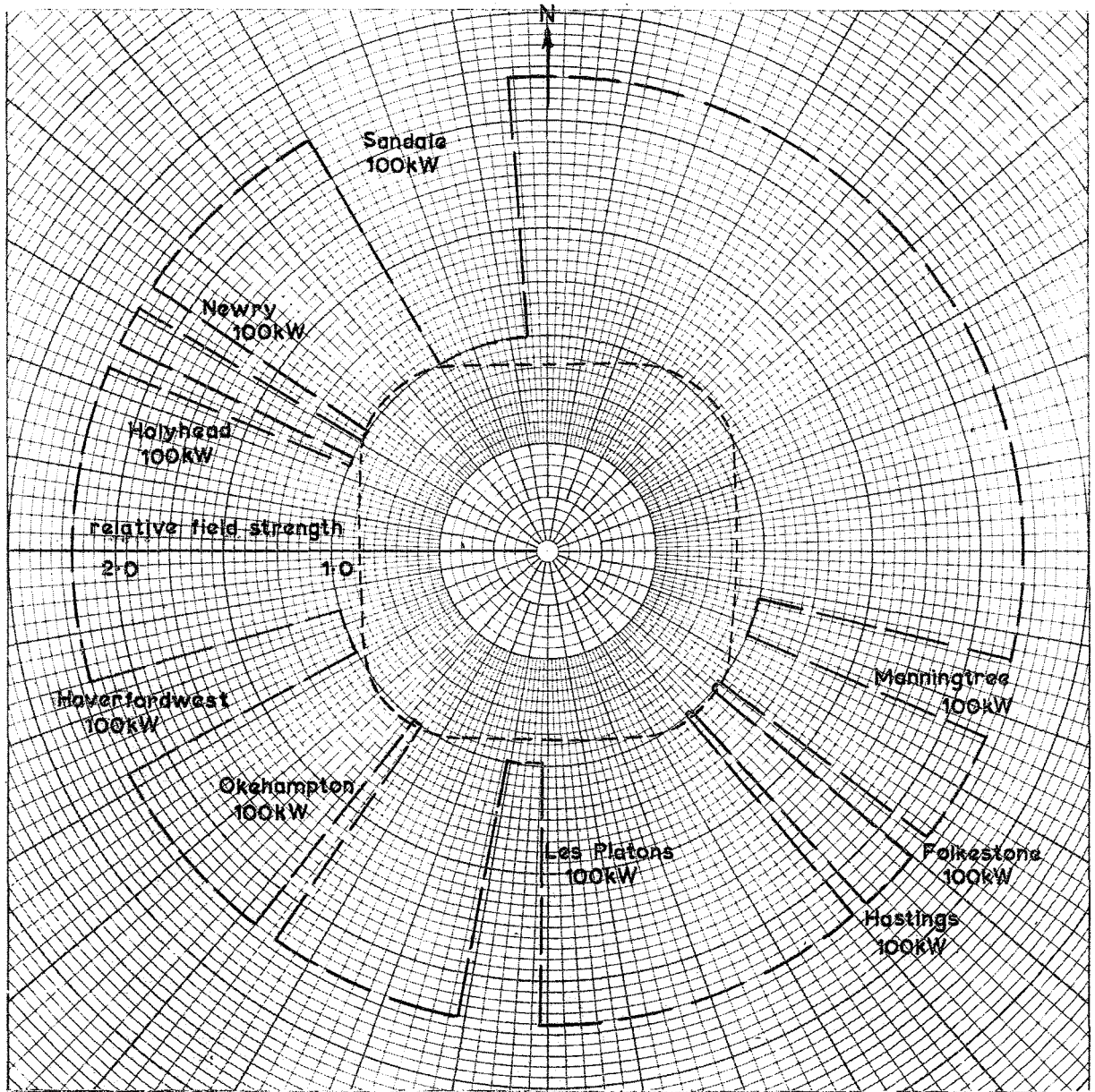


Fig. 3 Templet for new aerial
VERTICAL POLARIZATION
Channel 4 (Vision carrier 61.75Mc/s, Sound carrier 58.25Mc/s)
 ——— Maximum permissible E.R.P.
 - - - - - Minimum desirable E.R.P. (H.R.P. of original aerial)
 Unit field corresponds to an E.R.P. of 100kW

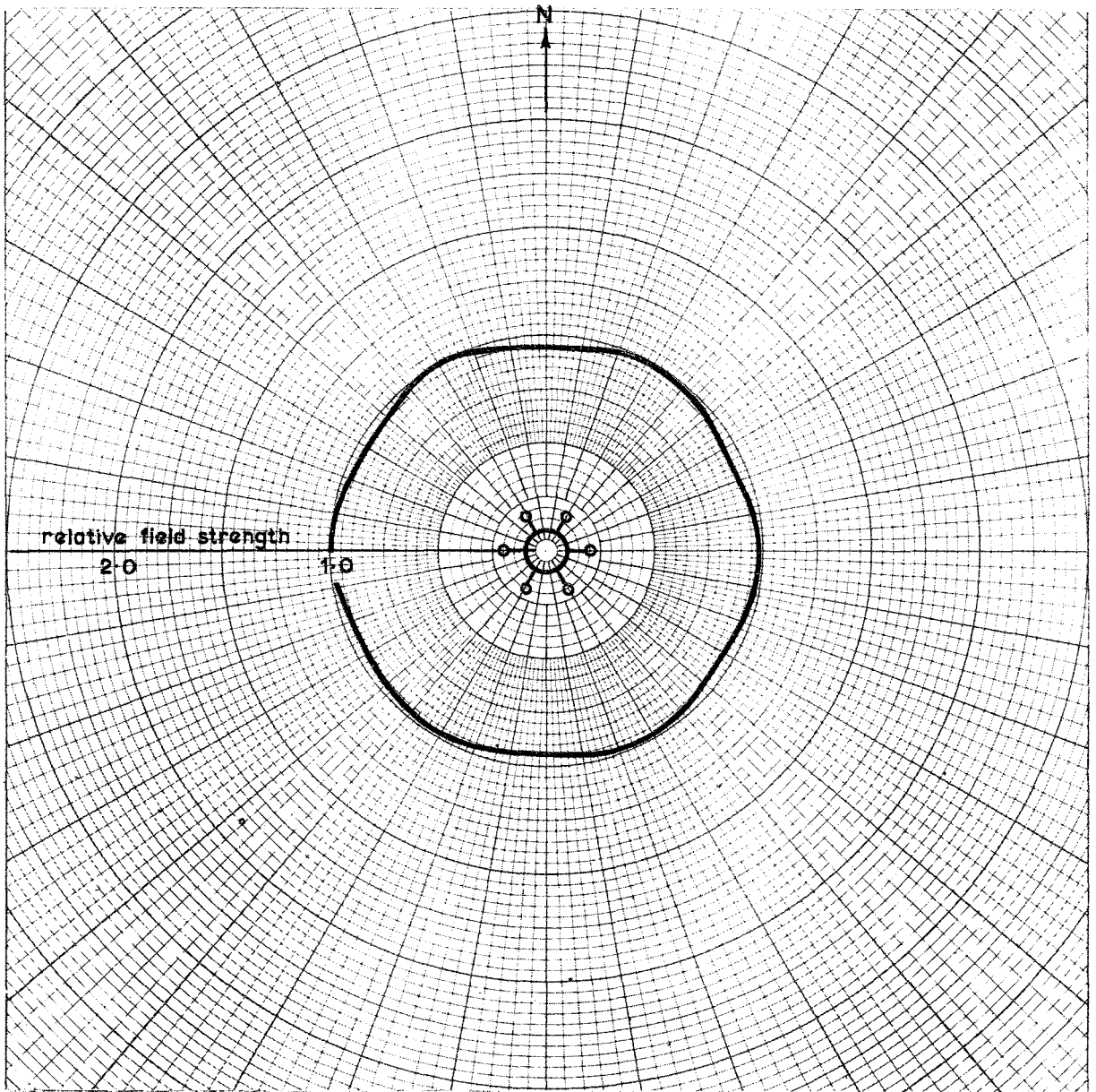


Fig. 4 Theoretical horizontal radiation pattern of aerial without stays

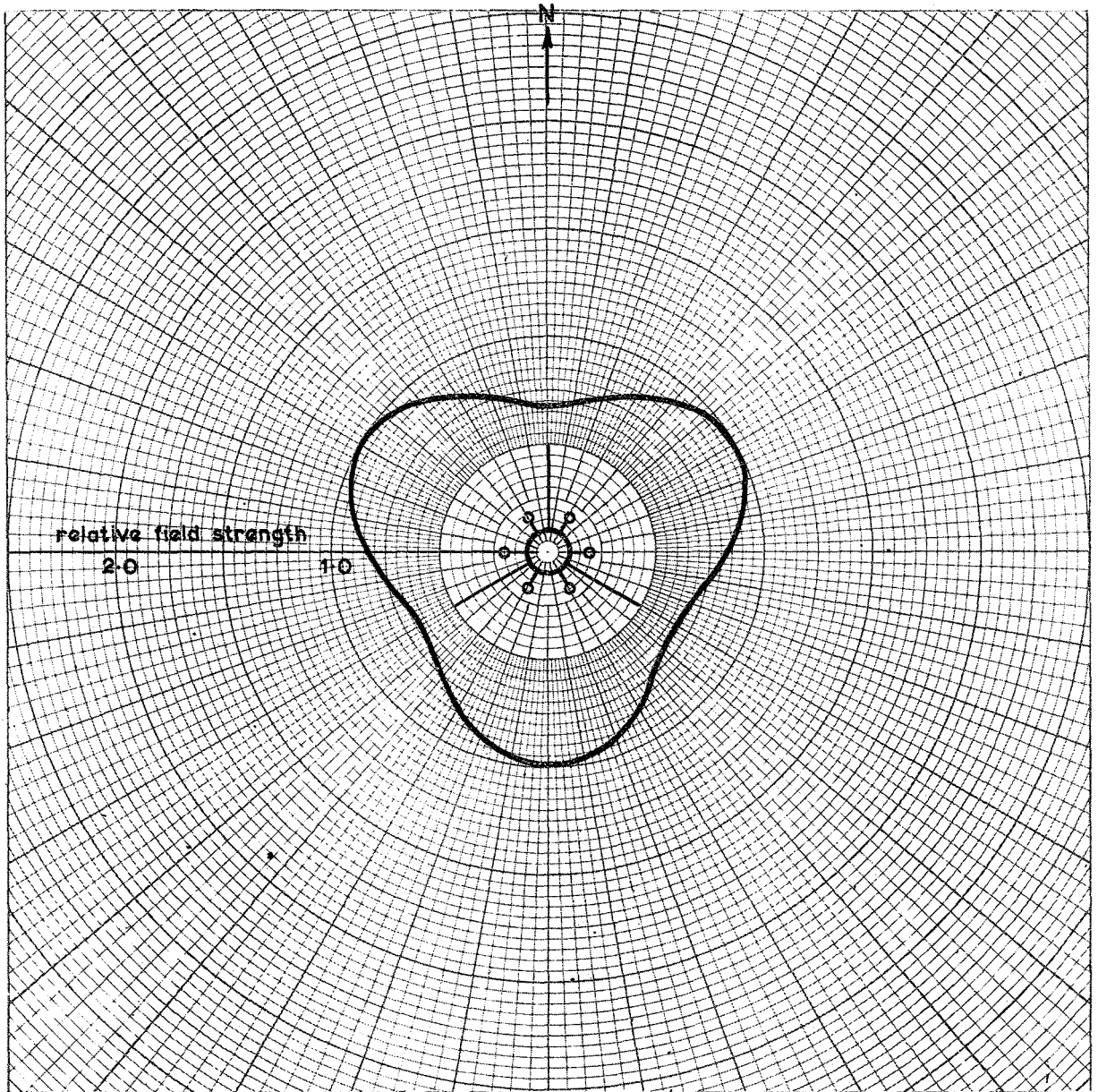


Fig. 5 Measured horizontal radiation pattern of aerial with stays

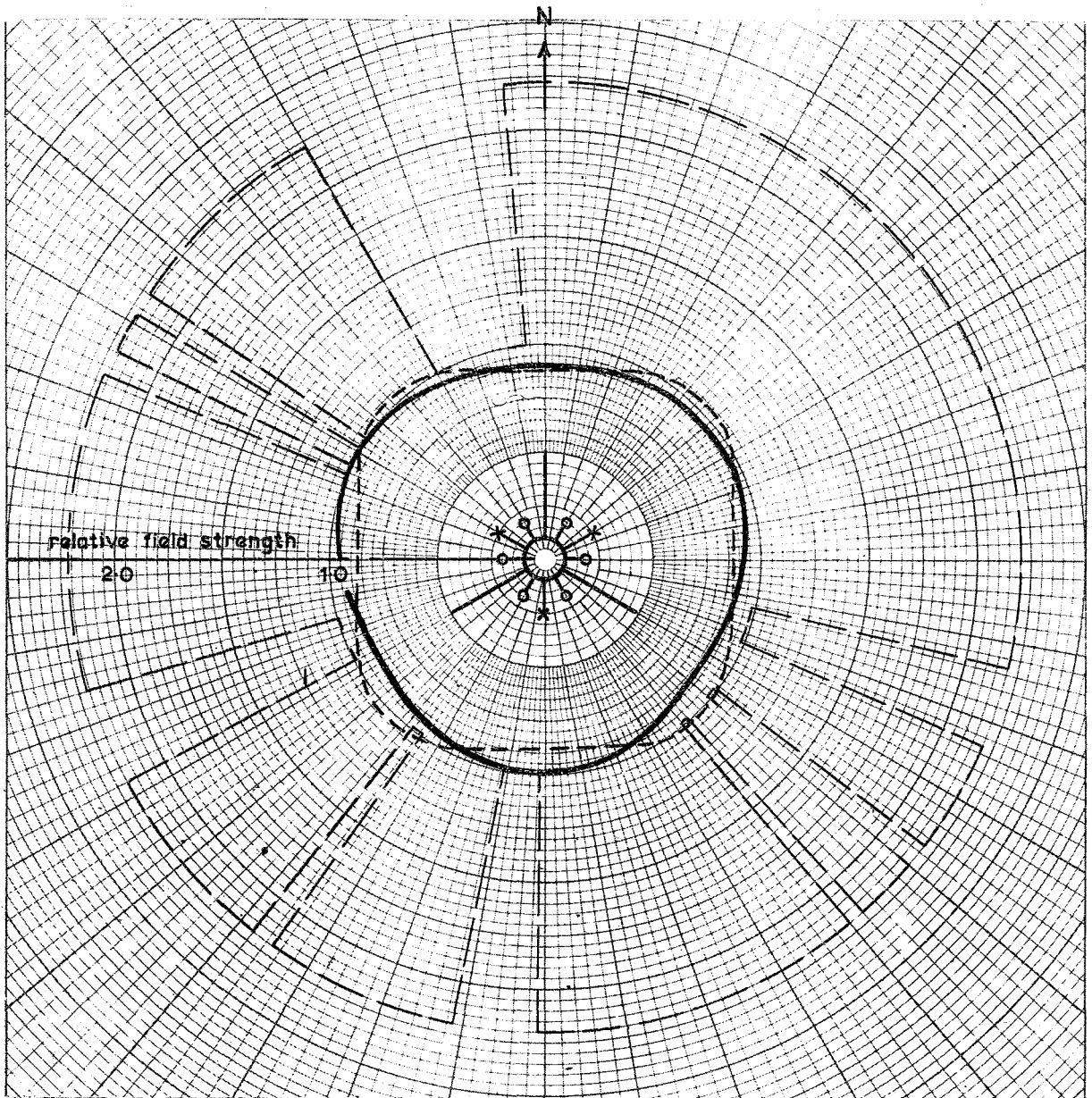


Fig. 6 Measured horizontal radiation pattern of aerial with stays and scattering elements

VERTICAL POLARIZATION

Channel 4 (Vision carrier 61.75Mc/s, Sound carrier 58.25Mc/s)

Mean effective gain 2.0dB

Transmitter power 55kW

Mean E.R.P. 89kW

—— ——— Maximum permissible E.R.P.

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

Unit field corresponds to an E.R.P. of 100kW