

RESEARCH DEPARTMENT

U.H.F. TRANSMITTING AERIAL FOR THE DURRIS TELEVISION STATION

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for Head of Research Department

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INTRODUCTION

A u.h.f. transmitting aerial for Kincardineshire has been built as a topmast on the existing 304.8 m (1000 ft) ITA mast at Durriss. The station started test transmissions from the aerial on July 15th, 1967 and started full service on July 29th, 1967.

SUMMARY OF INSTALLATION

- Site: The site is 11.3 km (7 miles) west-north-west of Stonehaven, national grid reference NO/763 897, height 323 m (1060 ft) a.o.d.
- Support Structure: The aerial is supported by a 304.8 m (1000 ft) stayed mast.
- General Arrangement: See Fig. 1.
- Channels: The aerial is designed to operate on four channels simultaneously. The BBC channels are 22 (BBC-1) and 28 (BBC-2). The ITA channels are 25 and 32. Channels 22, 25 and 28 have positive offset and 32 has negative offset.
- Aerial: The aerial comprises four tiers, each of four 4λ panels fed with nominally equal amplitude currents in phase rotation, giving a total radiating length which varies from 14.6λ at Channel 22 to 17.1λ at Channel 32. The panels, which were manufactured by Siemens and Halske, have been modified so that each half-panel is fed separately. The panels are supported on a 279 mm (11 in.) radius circle by a 273 mm (10.75 in.) diameter steel support pole. The whole aerial is enclosed within a 1.52 m (5 ft) diameter glass-fibre cylinder. Fig. 2 shows the arrangement of the panels inside the glass-fibre cylinder and Fig. 3 shows the construction of each panel.
- The mean height of the aerial is 311.8 m (1023 ft).
- Feeders: The arrangement of the distribution feeders is shown schematically in Fig. 4. The half-panels in each tier are fed in phase rotation and adjacent tiers are fed in quadrature. Each half of the aerial is connected to the transmitters by a main feeder type HF-6.1/8 - 50.
- Power: Two 25 kW vision transmitters and two 5 kW sound transmitters have been installed for use on Channel 28. The transmitters are run at the power required to give the maximum effective radiated power (e.r.p.) of 500 kW permitted under the Stockholm Agreement.
- Each vision transmitter is combined with a sound transmitter and the combined outputs are paralleled by means of a diplexer. The output from the diplexer is equally divided to the two main feeders by a splitter transformer. This arrangement eliminates any serious distortion that could occur at close range through differences between the modulation characteristics of the vision transmitters. A four-channel combining unit will be added later when required.
- Templet and horizontal radiation pattern (h.r.p.): The h.r.p. was required to be omnidirectional with a maximum e.r.p. not exceeding 500 kW. The specified tolerance on the h.r.p. uniformity was ± 2.5 dB. The h.r.p.s at the vision carrier frequencies of each operating channel, which are shown in Figs. 5 - 8, are the mean of measurements on each half of the aerial.

Vertical radiation pattern (v.r.p.): The v.r.p. was specified to be null-filled with the maximum of radiation tilted $1.2^\circ \pm 0.1^\circ$ below the horizontal. The v.r.p.s obtained for each face, shown in Figs. 9 - 12, were computed from measurements of the amplitudes and phases of the feeds to the half-panels, taken after erection.

Gain:	Channel	22 dB	25 dB	28 dB	32 dB
	Mean intrinsic gain	12.4	12.7	12.9	13.1
	<u>Deduct aerial losses</u>	dB	dB	dB	dB
	Null-filling	1.2	1.3	1.1	1.2
	Distribution feeder	0.2	0.2	0.2	0.2
	Distribution transformers	<u>0.1</u> <u>1.5</u>	<u>0.1</u> <u>1.6</u>	<u>0.1</u> <u>1.4</u>	<u>0.1</u> <u>1.5</u>
	Mean net gain	10.9	11.1	11.5	11.6
	<u>Deduct other losses</u>				
	Main feeder, HF 6.1/8-50	1.8	1.8	1.9	2.0
	Ground run	0.1	0.1	0.1	0.1
	Diplexer and splitter	<u>0.1</u> <u>2.0</u>	<u>0.1</u> <u>2.0</u>	<u>0.1</u> <u>2.1</u>	<u>0.1</u> <u>2.2</u>
	Mean effective gain	8.9	9.1	9.4	9.4
	H.R.P. maximum/mean ratio	1.4	1.6	1.7	1.9
	Maximum effective gain	10.3	10.7	11.1	11.3
<u>Programme feed:</u>	G.P.O. link.				

ACKNOWLEDGEMENTS

The mechanical and electrical design, construction and setting-to-work of the aerial were carried out by E.M.I. Electronics Ltd. in association with Siemens and Halske AG. The contracting authority was the Planning and Construction Department of the Independent Television Authority.

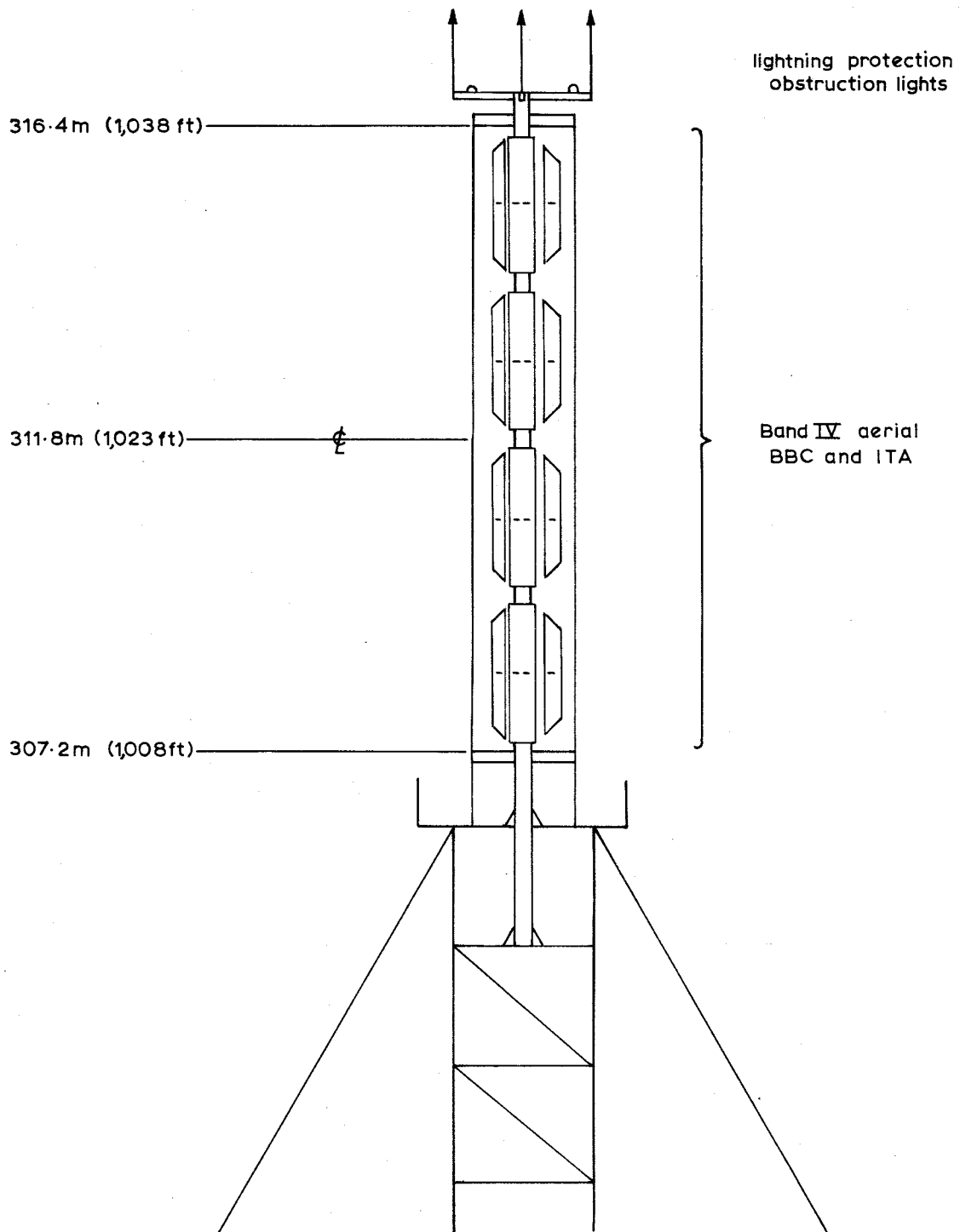


Fig.1. General arrangement of aerals on mast

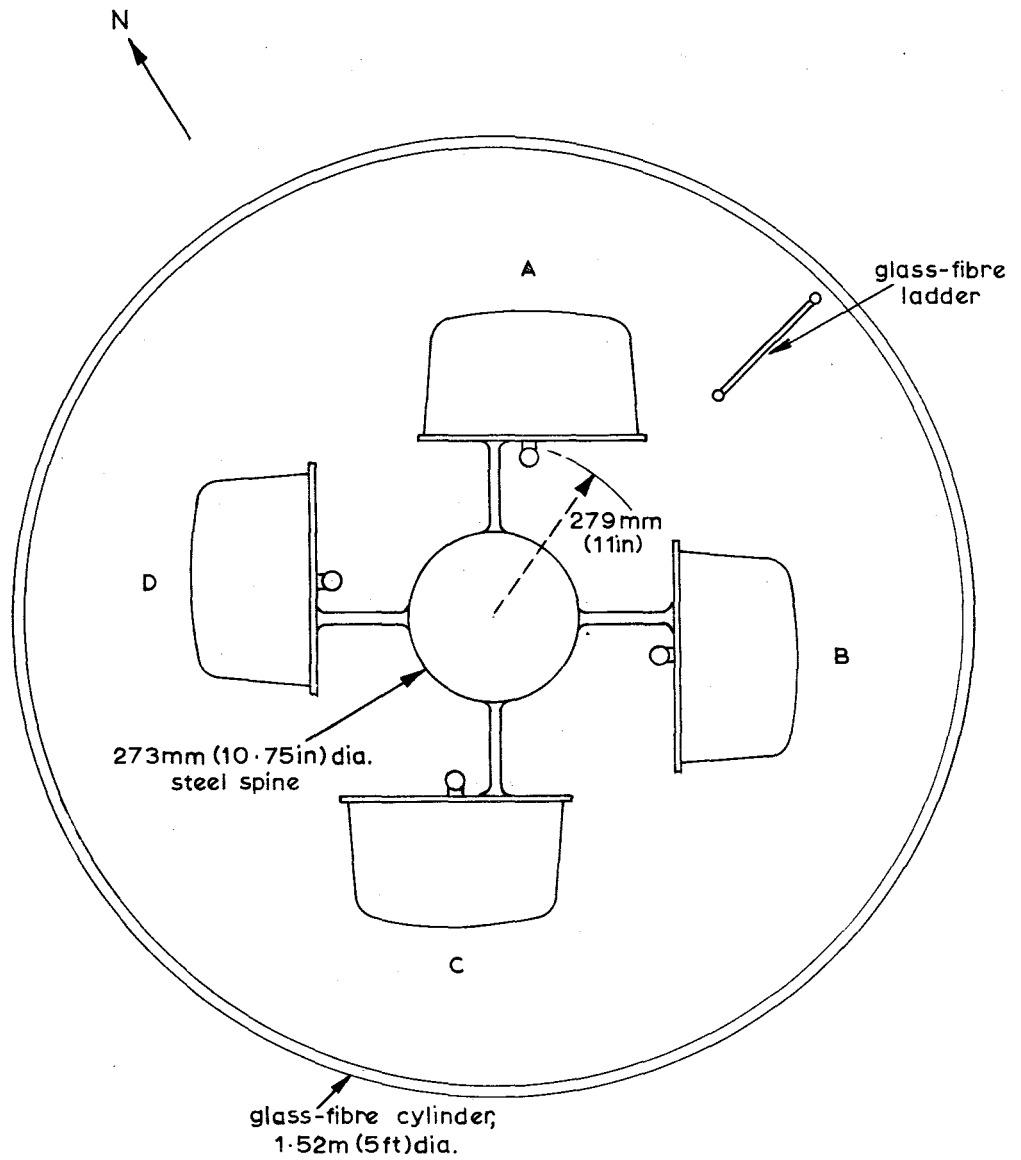


Fig.2. Arrangement of aerial panels in glass-fibre cylinder.

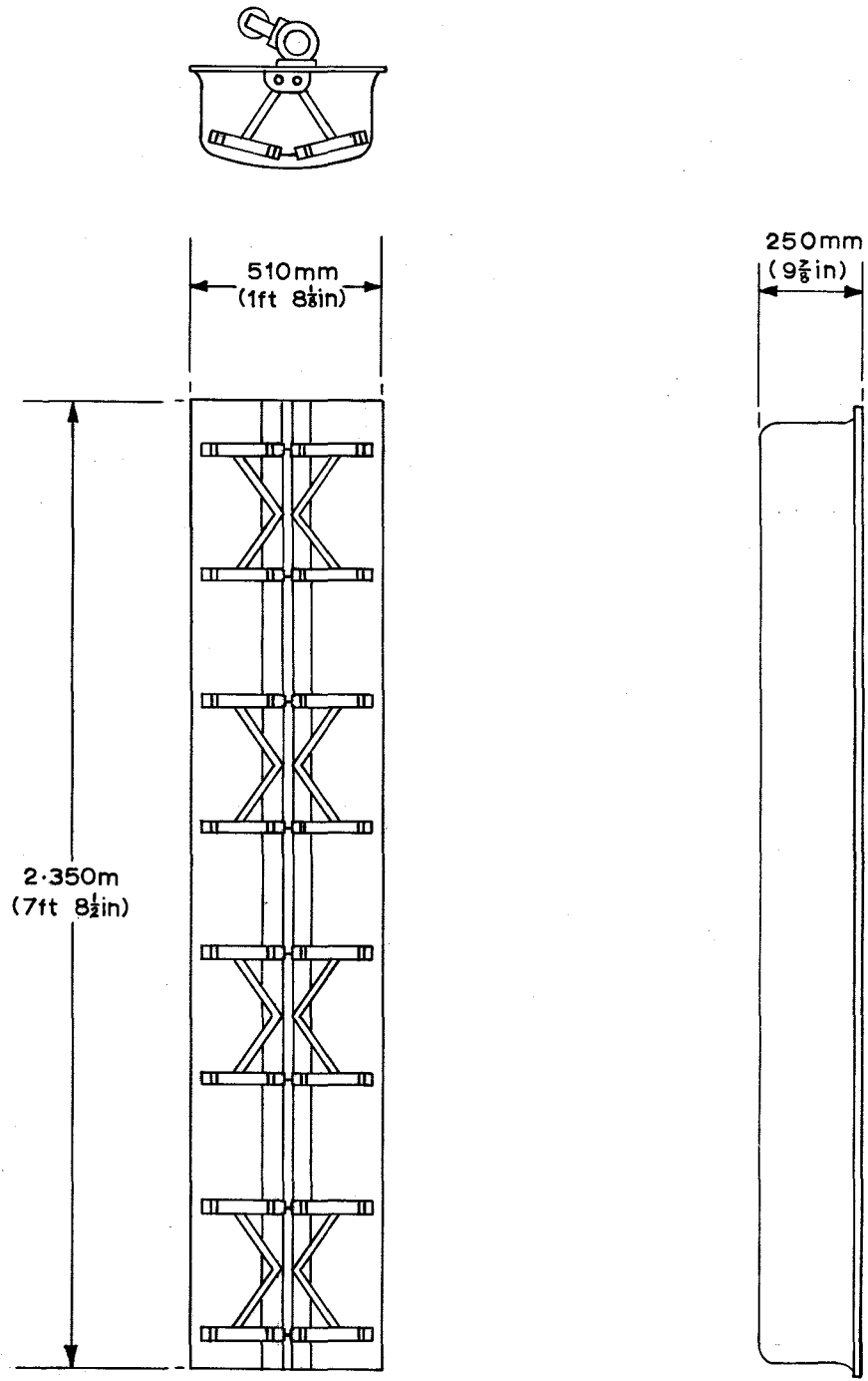


Fig. 3. Construction of aerial panel

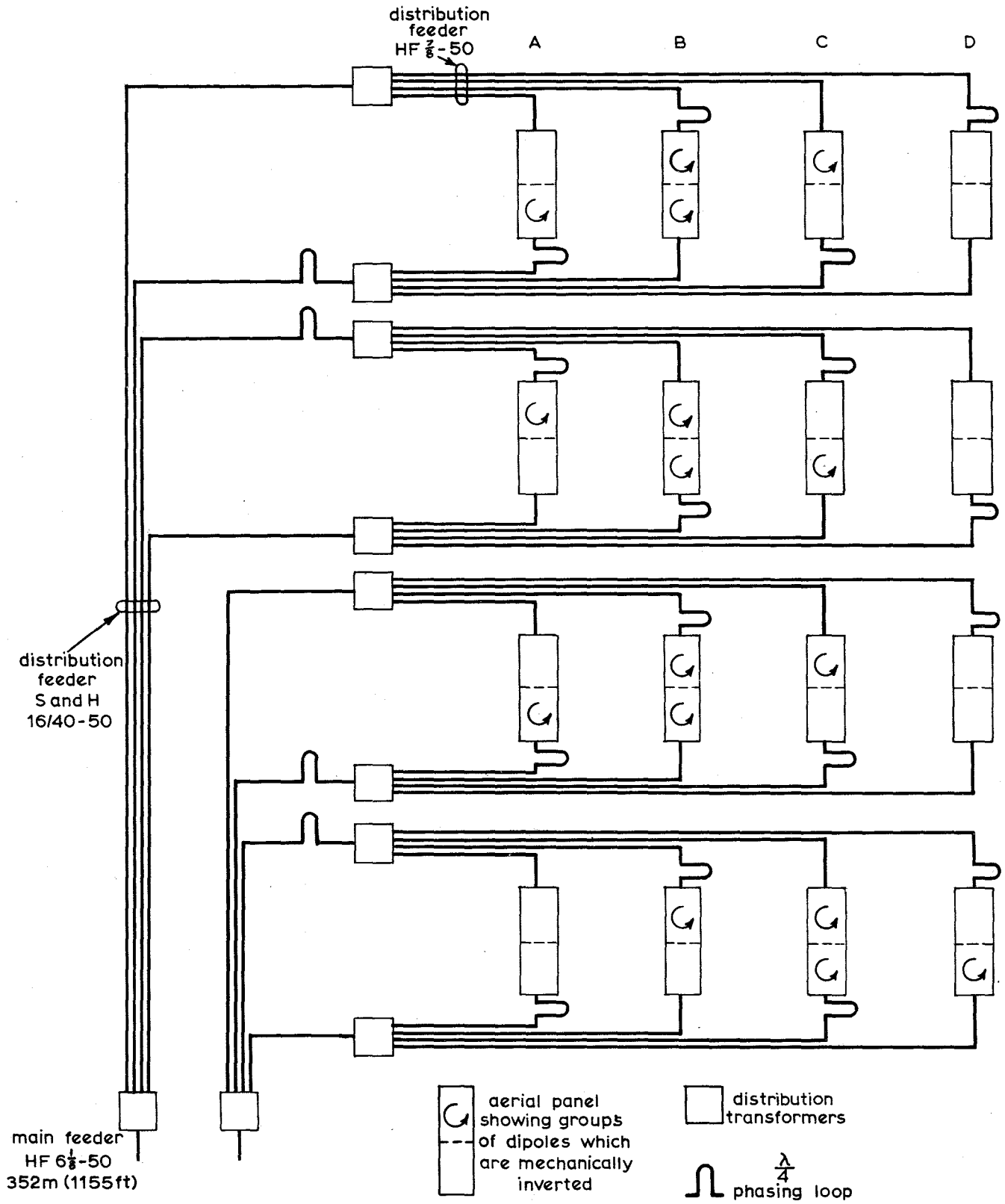


Fig. 4. Schematic arrangement of distribution feeder.

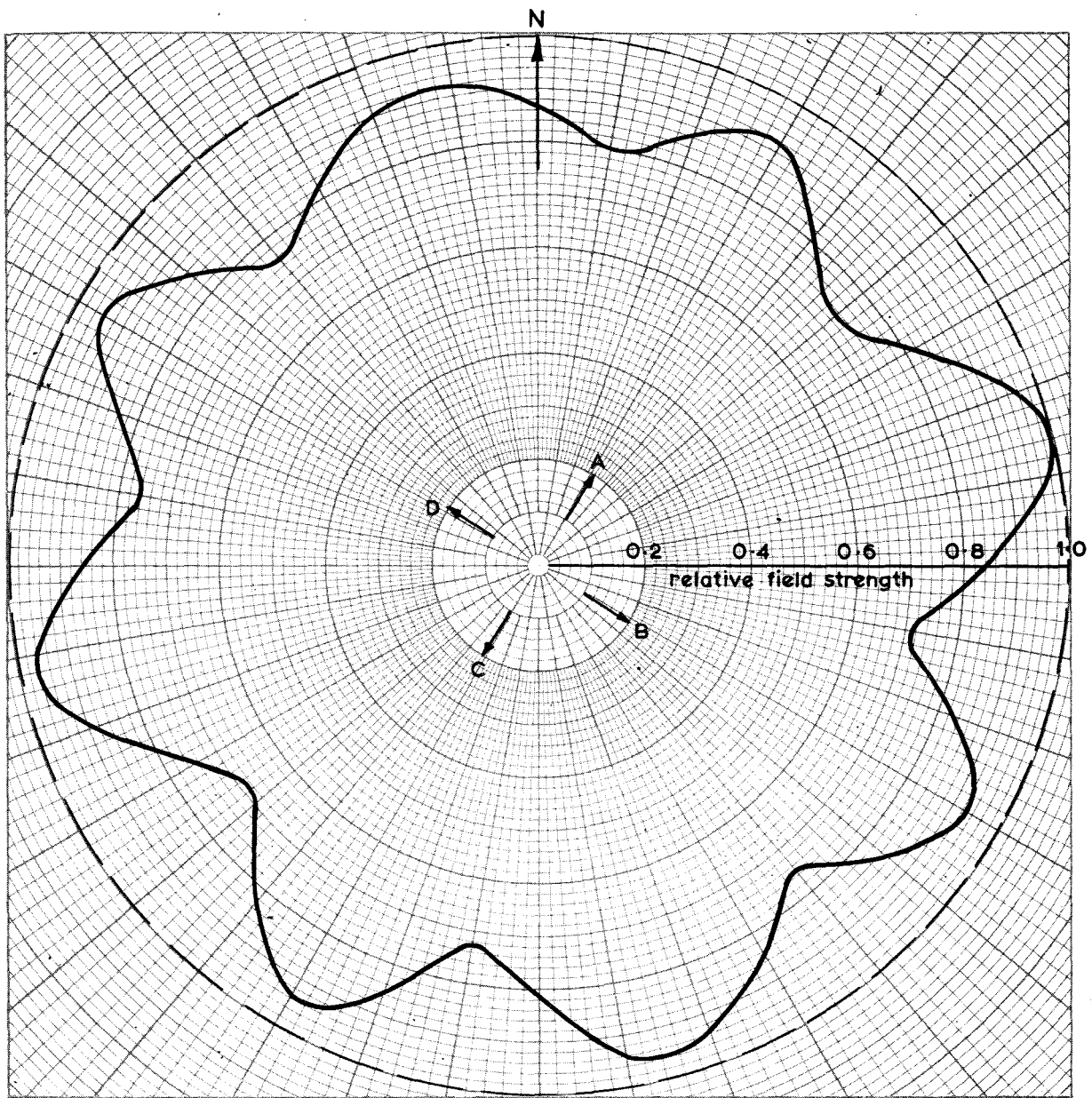


Fig. 5. Horizontal radiation pattern: Channel 22(BBC 1)
HORIZONTAL POLARIZATION

Vision carrier 479.25MHz , Sound carrier 485.25MHz

Mean effective gain: 8.9dB

Peak vision transmitter power: 2 x 23kW

Mean E.R.P.: 365kW

———— Stockholm E.R.P limit

Unit field corresponds to an E.R.P. of 500kW

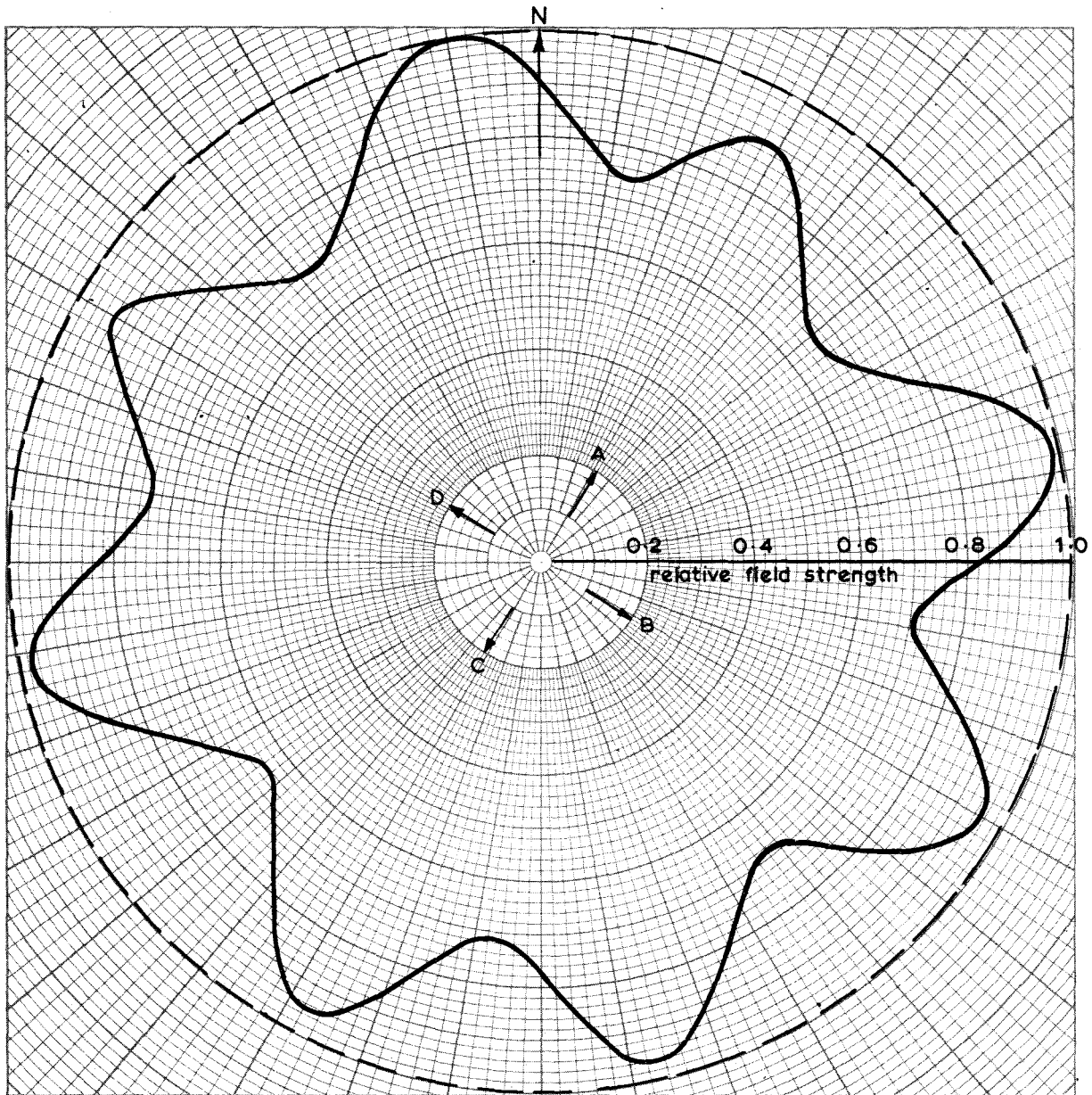


Fig. 6. Horizontal radiation pattern: Channel 25

HORIZONTAL POLARIZATION

Vision carrier 503.25MHz, Sound carrier 509.25MHz

Mean effective gain: 9.1dB

Peak vision transmitter power: 2 x 21kW

Mean E.R.P.: 345 kW

— — — Stockholm E.R.P. limit

Unit field corresponds to an E.R.P. of 500kW

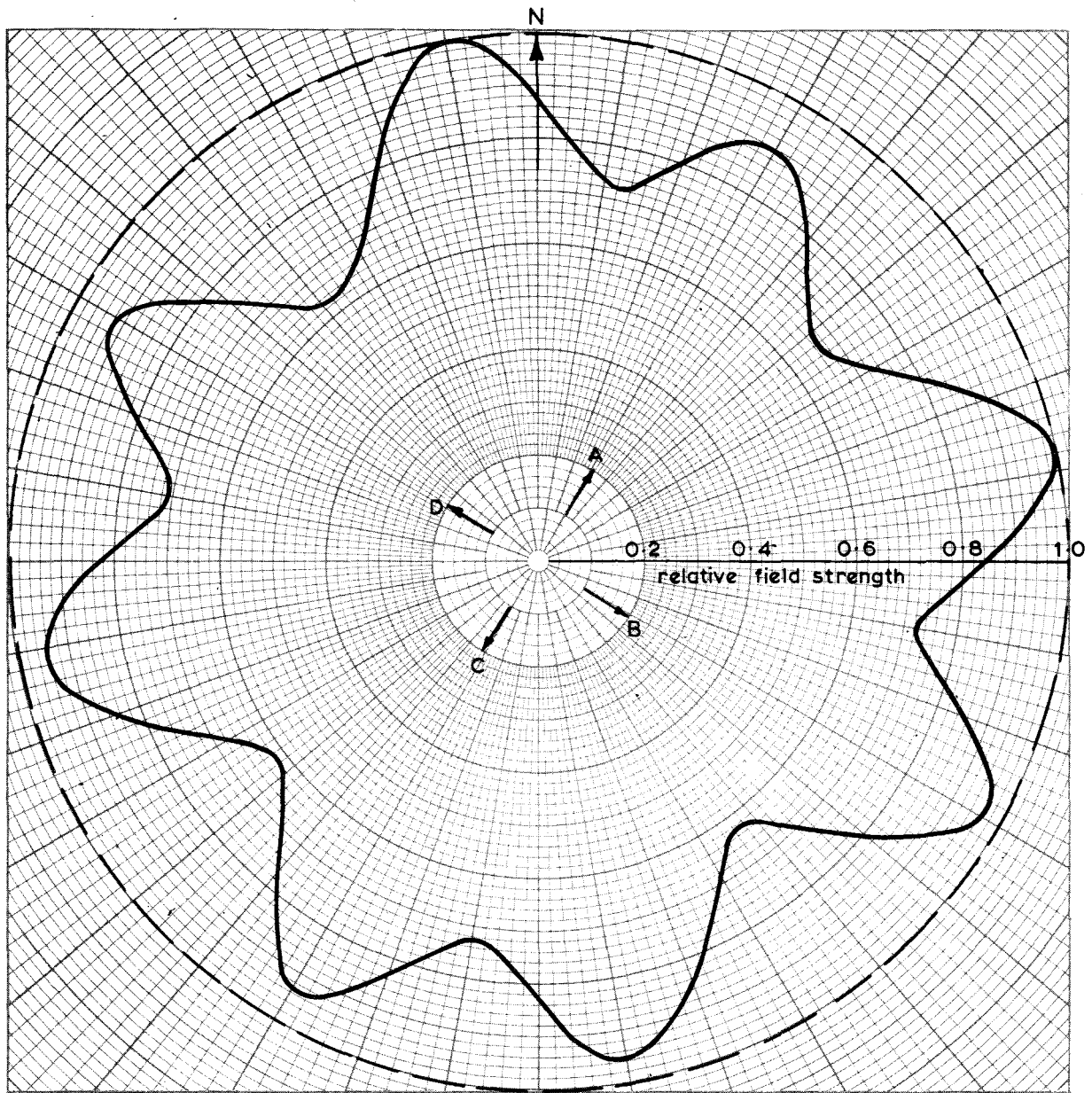


Fig. 7. Horizontal radiation pattern: Channel 28 (BBC 2)

HORIZONTAL POLARIZATION

Vision carrier 527.25MHz, Sound carrier 533.25MHz

Mean effective gain: 9.4dB

Peak vision transmitter power: 2 x 19kW

Mean E. R. P. : 335kW

----- Stockholm E. R. P. limit

Unit field corresponds to an E. R. P. of 500kW

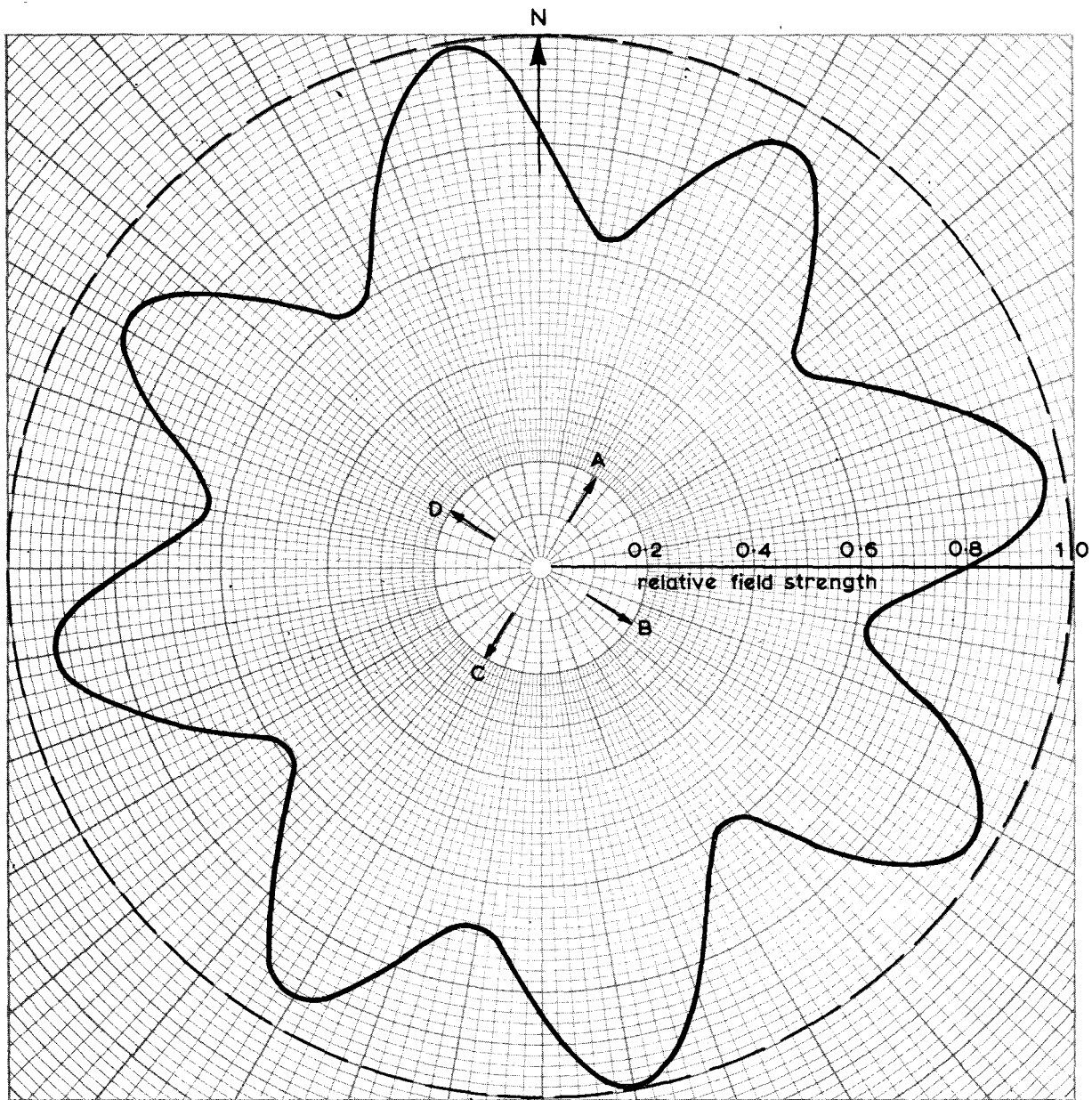


Fig. 8. Horizontal radiation pattern: Channel 32
HORIZONTAL POLARIZATION

Vision carrier 559.25MHz, Sound carrier 565.25MHz.

Mean effective gain: 9.4dB

Peak vision transmitter power: 2 x 18 kW

Mean E. R. P.: 320kW

----- Stockholm E. R. P. limit

Unit field corresponds to an E.R.P. of 500kW

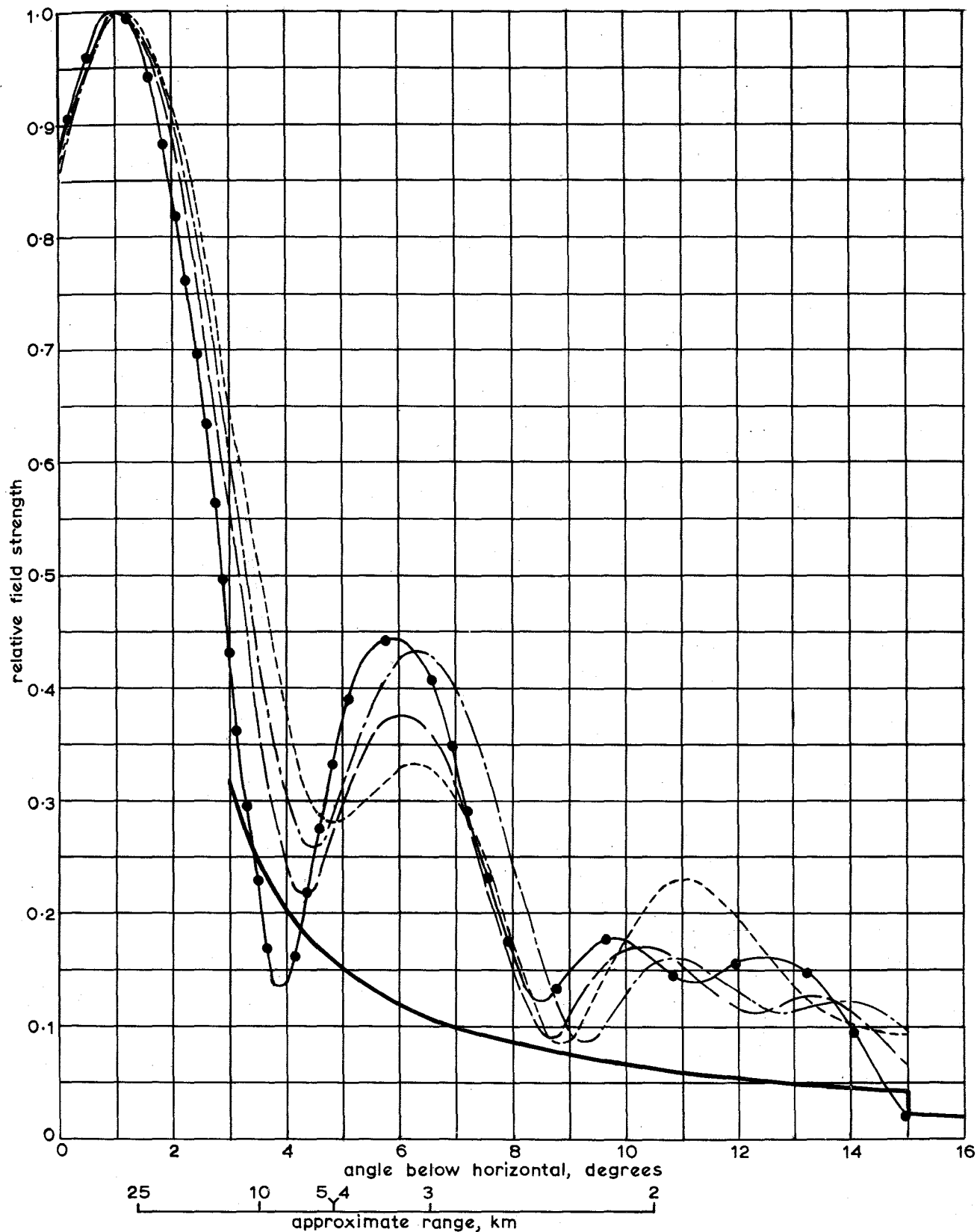


Fig. 9. Vertical radiation pattern on bearing 32° E TN (face A)

- - - - - Channel 22 (BBC 1) - - - - - Channel 25
 - - - - - Channel 28 (BBC 2) ● - - - - ● Channel 32
 ————— Specified minimum field

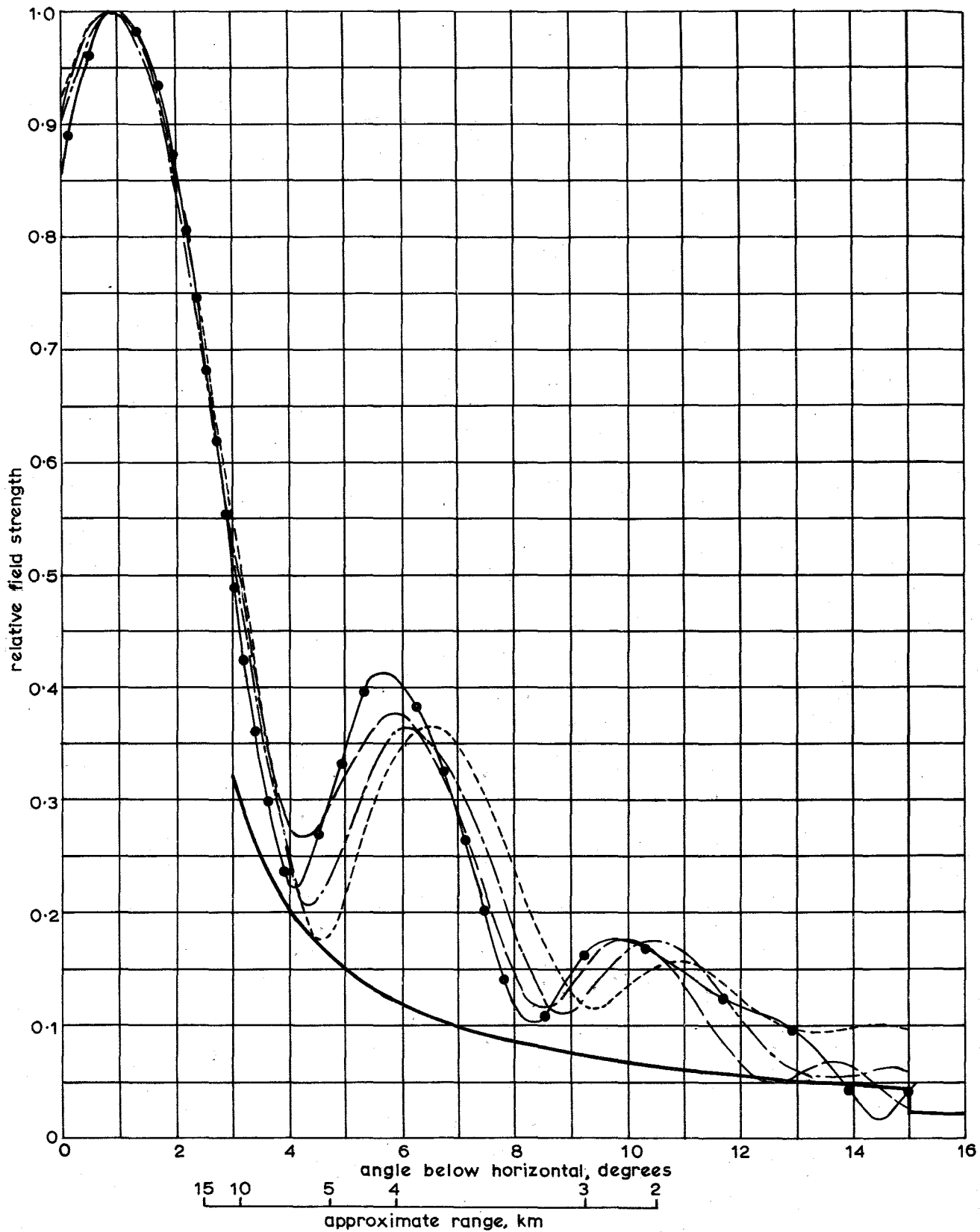


Fig. 10. Vertical radiation pattern on bearing 122° ETN(face B)

- - - - - Channel 22 (BBC 1) - - - - - Channel 25
 - - - - - Channel 28 (BBC 2) ● - - - - ● Channel 32
 ————— Specified minimum field

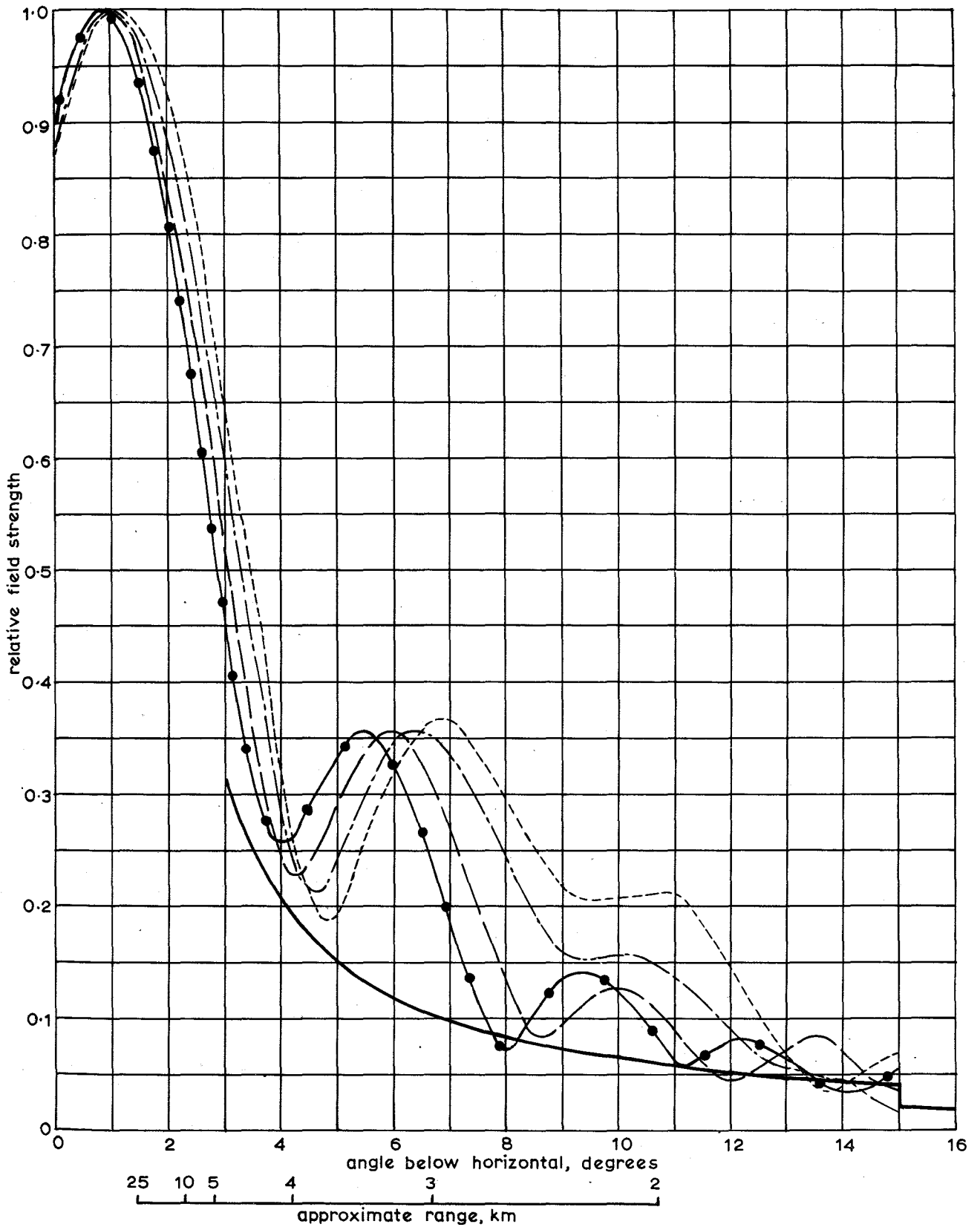


Fig. 11. Vertical radiation pattern on bearing 212°E T N (face C)

- - - - - Channel 22 (BBC 1) - · - · - Channel 25
 - - - - - Channel 28 (BBC 2) · - · - · Channel 32
 ————— Specified minimum field

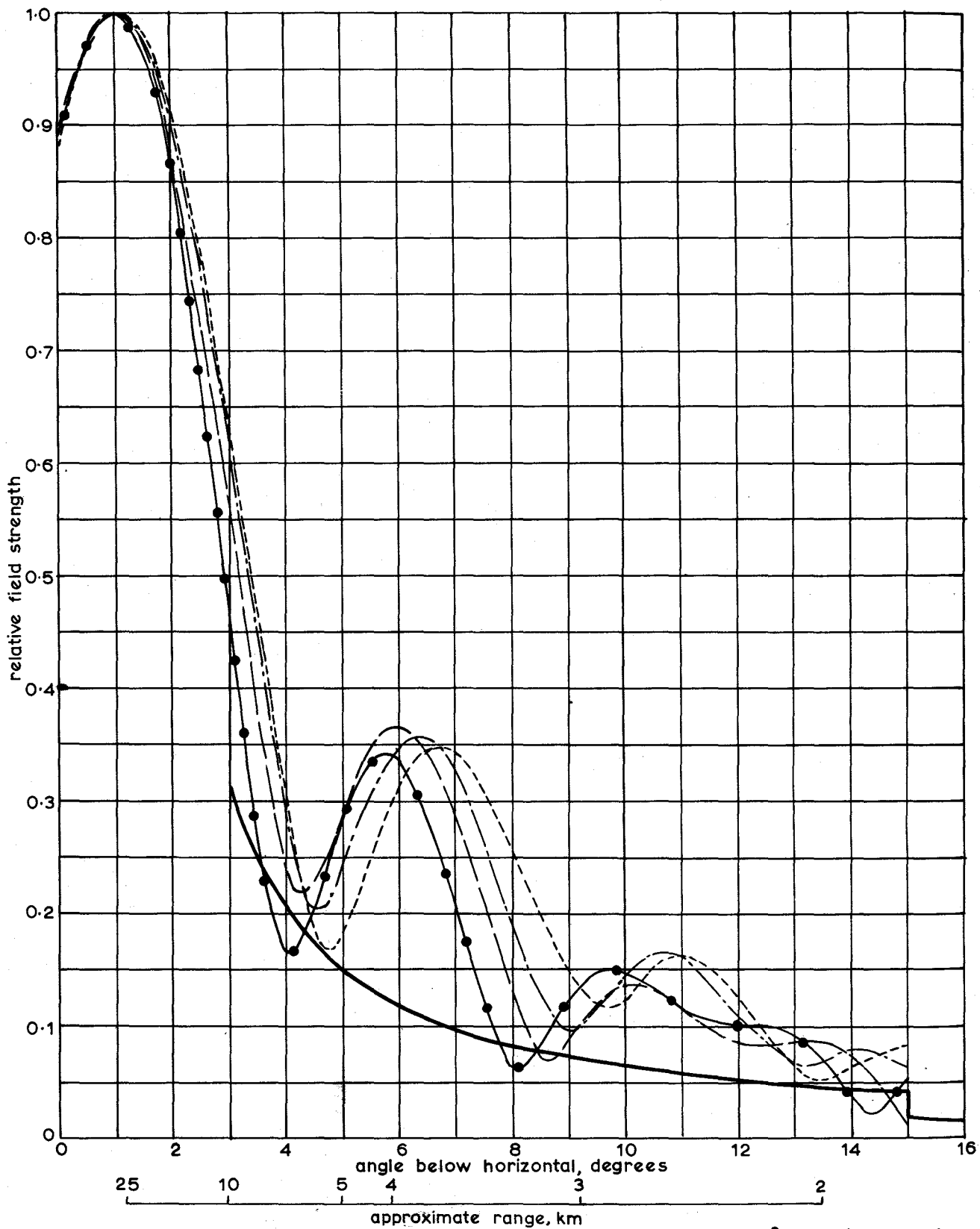


Fig.12. Vertical radiation pattern on bearing 302°ETN(face D)

- - - - - Channel 22 (BBC 1) - · - · - Channel 25
 ——— Channel 28 (BBC 2) ····· Channel 32
 ——— Specified minimum field