

RESEARCH DEPARTMENT

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

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for Head of Research Department

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

INTRODUCTION

A u.h.f. transmitting aerial for the East Lincolnshire area has been built on the support column of the ITA mast at Belmont. The aerial started trade tests on 5th November 1966 and full service on 19th November 1966.

SUMMARY OF INSTALLATION

- Site: The site is 12 km (7.5 miles) west-south-west of Louth, grid reference TF 217837, height 128 m (420 ft) a.o.d.
- Support Structure: The aerial is supported by a 386 m (1265 ft) stayed mast. Up to a height of 274 m (900 ft), the mast is cylindrical with a diameter of 2.74 m (9 ft) and this section is equipped with a lift. Between 274 m (900 ft) and 336 m (1102 ft) the cross-section is triangular with a side of 1.98 m (6 ft 6 in.). Above 336 m (1102 ft) the cross-section is triangular with a side of 1.30 m (4 ft 3 in.). The mast stays, which are attached to the corners of the triangular sections, are on bearings 61° , 181° and 301° E.T.N.
- General Arrangement: See Fig. 1.
- Channels: The aerial is designed to radiate on the two BBC channels, 22 and 28, of which the latter is used for the opening service (BBC-2). Both channels have negative offset.
- Aerial: The aerial comprises six tiers, each of six 5λ panels, giving a total radiating length of 29.3λ at Channel 22 and 32.2λ at Channel 28. The panels of each tier are mounted in pairs on the faces of the support mast and are fed with co-phased currents. The aerial is protected from the weather by a 2.74 m (9 ft) diameter glass-fibre cylinder. Fig. 2 shows the arrangement of the panels on the mast and Fig. 3 shows the construction of each panel.
- The mean height of the aerial is 348 m (1143 ft).
- Feeders: The arrangement of the distribution feeder is shown schematically in Fig. 4. Each half of the aerial is connected to the transmitters by a feeder type F and G. 6.1/8 - 50.
- Power: Two 12.5 kW vision transmitters and two 2.5 kW sound transmitters will be provided for each channel; at present only those for Channel 28, manufactured by Pye, have been installed. Each transmitter will be 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 followed by a splitter transformer feeding the two halves of the aerial. This arrangement is employed to prevent differences between the modulation characteristics of the vision transmitters causing distortion of the received signal in areas corresponding to the aerial radiation pattern minima. A two-channel combining unit will be added later, as required.

Templet and horizontal radiation pattern (h.r.p.):

The h.r.p. was required to be omni-directional 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 the two operational channels, which are shown in Figs. 5 and 6, are the mean of measurements made at the contractor's test site on each half of the full-scale aerial.

Vertical radiation pattern (v.r.p.):

The v.r.p. was specified to be gapfilled with the maximum of radiation tilted below the horizontal; this is achieved by means of a phase distribution of the feed currents to the panels over the length of the aerial. The v.r.p.s obtained for each face, shown in Figs. 7-9, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:	Channel	22	28
		dB	dB
	Mean intrinsic gain	15.0	15.0
	<u>Deduct aerial losses:</u>	dB	dB
	Gapfilling	1.2	1.0
	Distribution feeder	0.2	0.2
	Distribution transformers	<u>0.1</u> <u>1.5</u>	<u>0.1</u> <u>1.3</u>
	Mean net gain	13.5	13.7
	<u>Deduct other losses:</u>		
	Main feeder (1240 ft) F and G 6.1/8 - 50	2.0	2.0
	Feeder ground run (40 ft)	0.1	0.1
	Diplexer and splitting transformer	<u>0.1</u> <u>2.2</u>	<u>0.1</u> <u>2.2</u>
	Mean effective gain	<u>11.3</u>	<u>11.5</u>
	H.R.P. maximum/mean ratio	<u>2.3</u>	<u>2.0</u>
	Maximum effective gain	<u>13.6</u>	<u>13.5</u>

Programme feed:

Direct reception of Emley Moor. The receiving aerials consist of two G.S.V. double 10-element Yagi arrays mounted on the support mast at 73 m (240 ft) a.g.l. and are for use on Emley Moor Channel 51 (BBC-2) only. Each aerial is connected to a receiver at ground level by a feeder type HF 7/8 - 50.

ACKNOWLEDGMENTS

The mechanical and electrical design, construction and setting to work of the aerial were carried out by E.M.I. Electronics Ltd. The contracting authority was the BBC Transmitter Planning and Installation Department.

REFERENCES

Detailed information on the construction of the aerial panels is given on the following drawing held by Transmitter Planning and Installation Department:

L.H. Panel Assembly - BBC U.H.F. Belmont E.M.I. Electronics Ltd., Drawing No. 9A/D88750

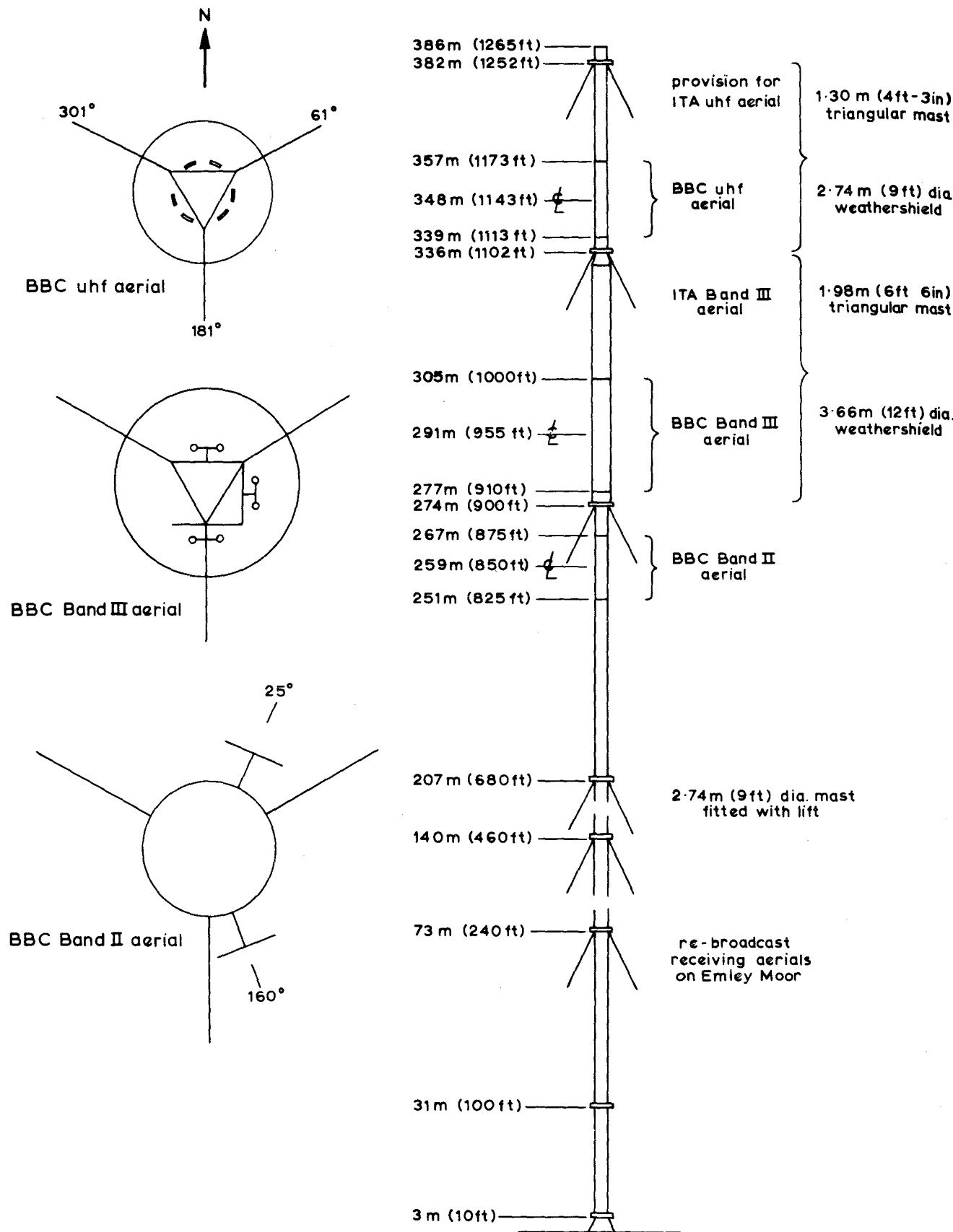


Fig. 1. General arrangement of aerials on mast.

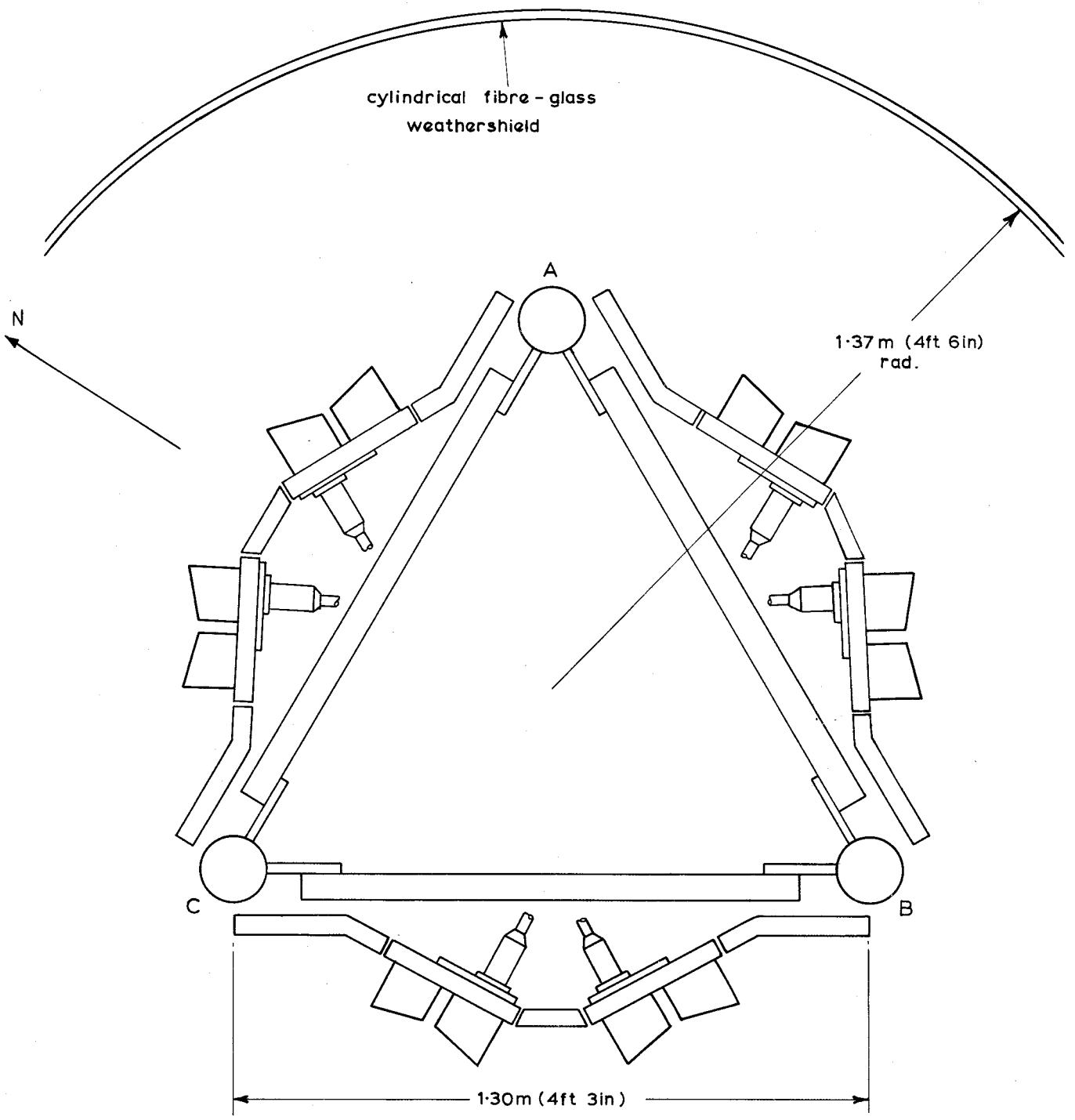


Fig. 2. Arrangement of u.h.f. aerial on the support mast.

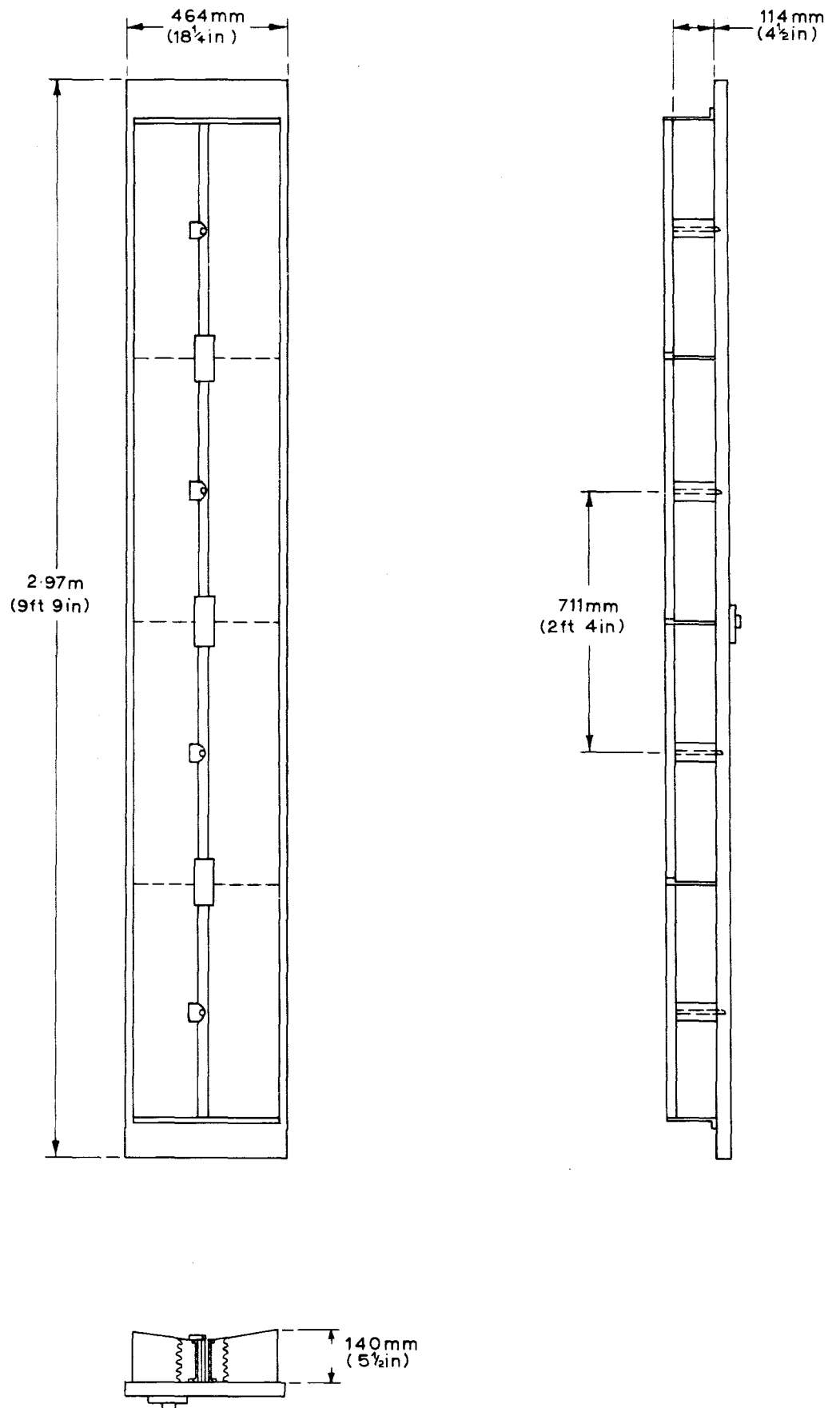


Fig. 3. Construction of aerial panel.

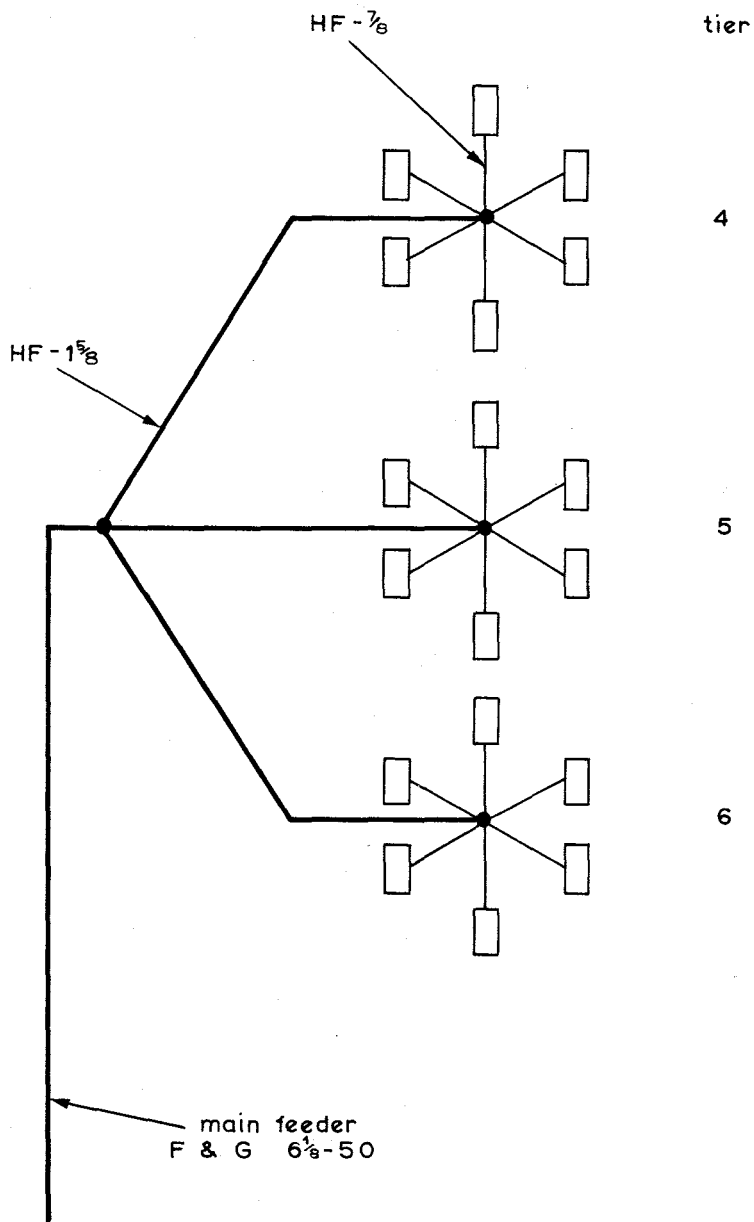


Fig. 4. Schematic arrangement of distribution feeder (lower half aerial)

□ aerial panel

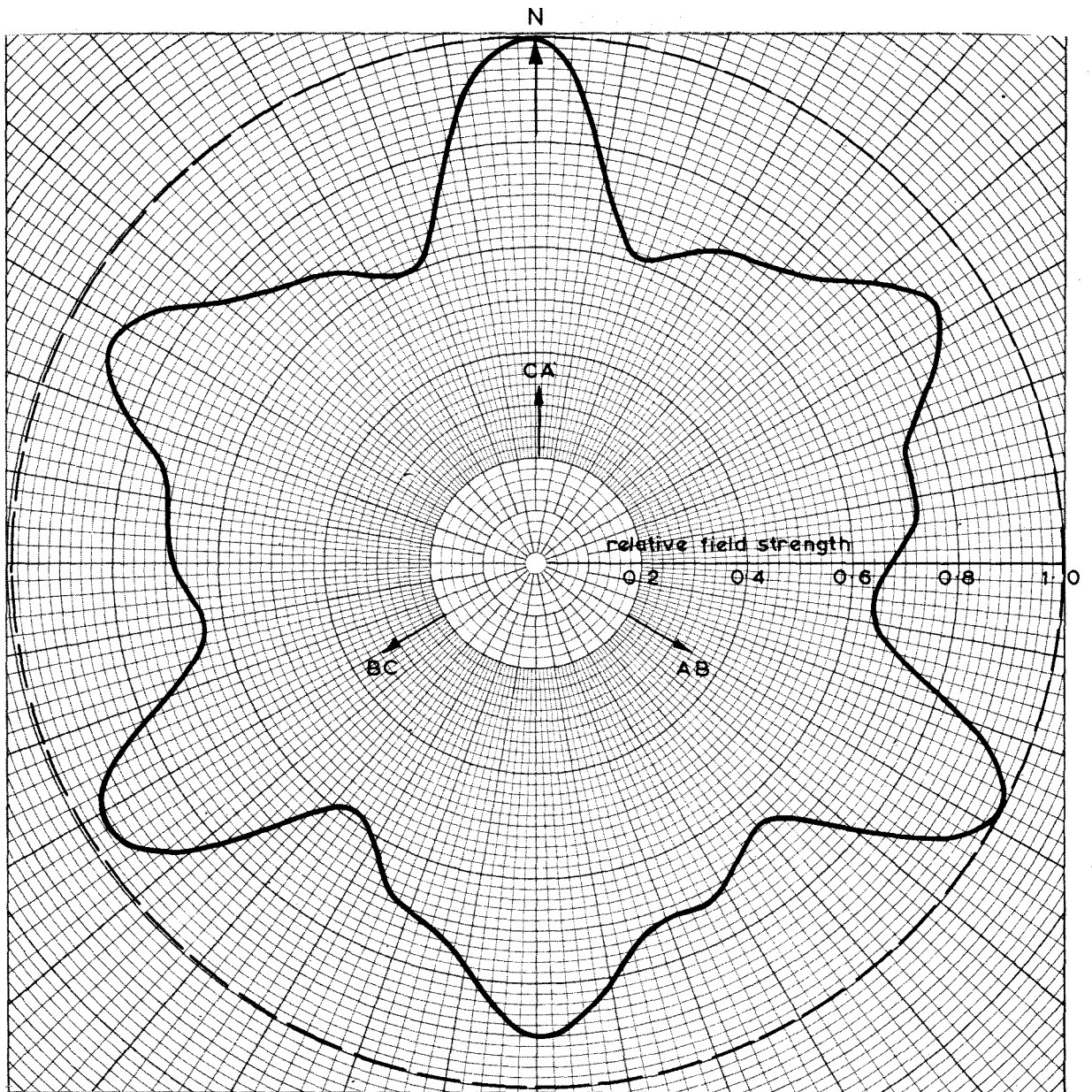


Fig. 5. Horizontal radiation pattern: Channel 22.

HORIZONTAL POLARIZATION

Vision carrier 479.25 MHz, Sound carrier 485.25 MHz.

Mean effective gain: 11.3 dB

Peak vision transmitter power: 2x11 kW

Mean E.R.P.: 295 kW

— — — Stockholm E.R.P. limit.

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

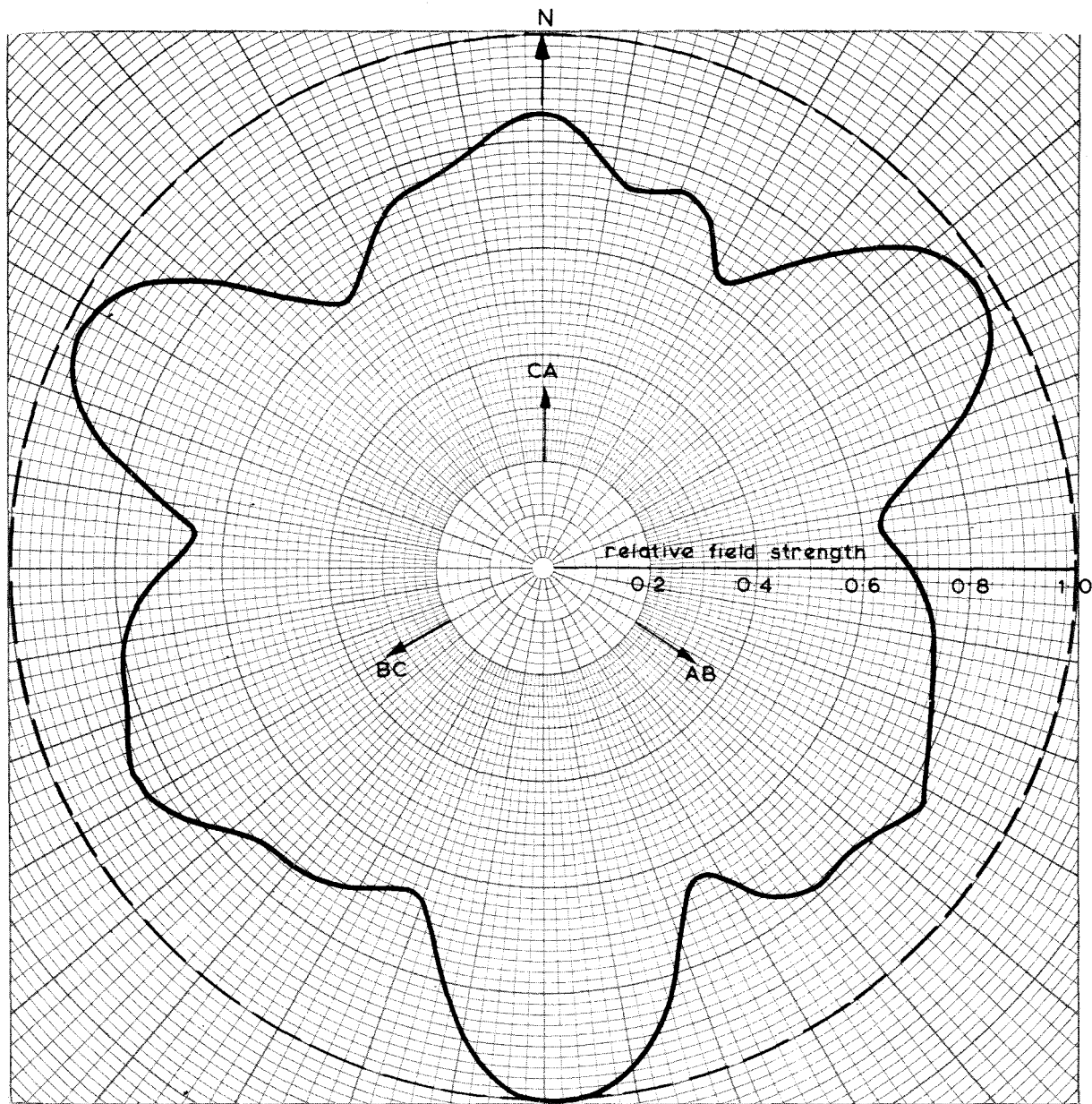


Fig. 6. Horizontal radiation pattern: Channel 28
HORIZONTAL POLARIZATION

Vision carrier 527.25 MHz, Sound carrier 533.25 MHz.

Mean effective gain: 11.5 dB

Peak vision transmitter power: 2×11 kW

Mean E.R.P.: 315 dB

———— Stockholm ERP. limit

Unit field corresponds to an ERP of 500 kW

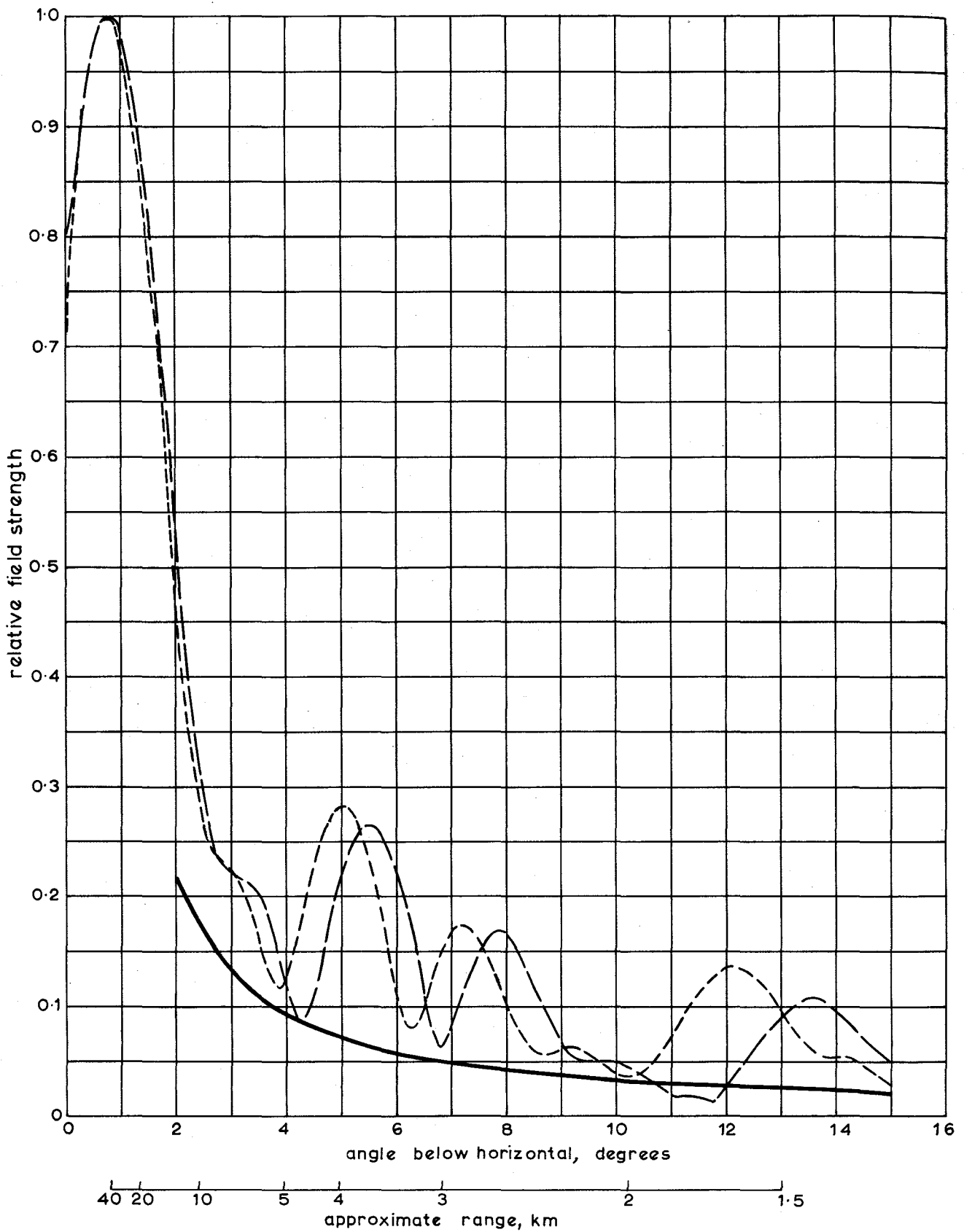


Fig. 7. Vertical radiation pattern on bearing 001° E.T.N (side CA)

- Channel 22
- · - · - Channel 28
- Specified minimum field

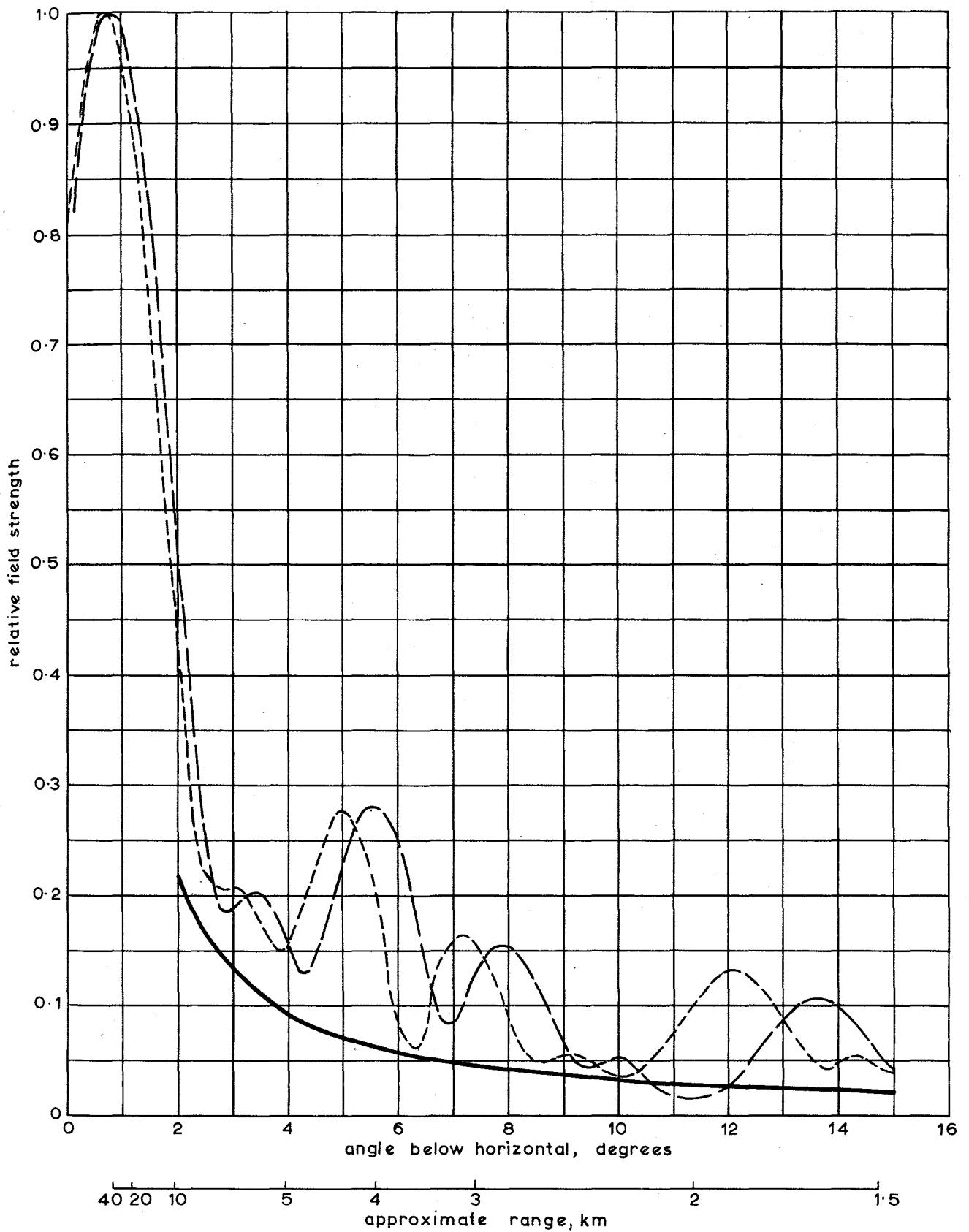


Fig. 8. Vertical radiation pattern on bearing 121° E.T.N. (side AB)

- Channel 22
- - - Channel 28
- Specified minimum field.

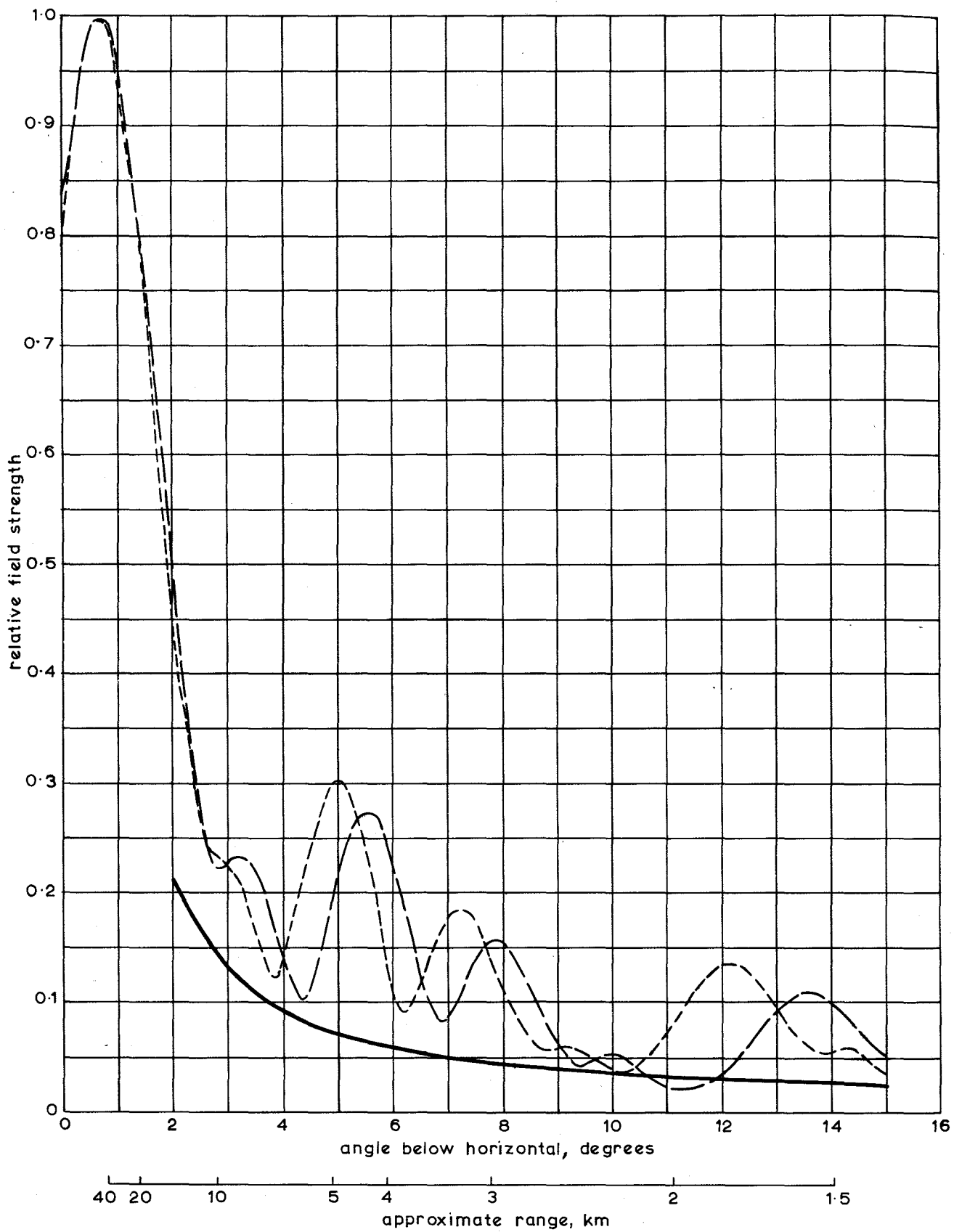


Fig. 9. Vertical radiation pattern on bearing 241° E.T.N. (side BC)

——— Channel 22
 - - - - - Channel 28
 ——— Specified minimum field