RESEARCH DEPARTMENT

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

Technological Report No. RA-15/2
UDC 621.396.712 1968/9

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for Head of Research Department

This Report uses SI units in accordance with B.S. document PD 5686.

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INTRODUCTION

A u.h.f. transmitting aerial for the Suffolk area has been built as a top-mast on the new BBC mast at Sudbury. The station started trade tests on 27th January 1968 and full service on 10th February 1968.

SUMMARY OF INSTALLATION

Site: The site is 4·8 km (3 miles) south-east of Sudbury, Suffolk, grid reference TL 913377, height 68·6 m (225 ft) a.o.d.

Support Structure: The aerial is supported by a 141·7 m (465 ft) stayed mast of triangular cross-section with a side of 1·52 m (5 ft). From 137·2 m (450 ft) to 141·7 m (465 ft) the mast side reduces to 991 mm (3 ft 3 in.) and the orientation changes by 30° clockwise. The mast stays are on bearings of 9°, 129° and 249° ETN.

General Arrangement: See Fig. 1.

Channels: The aerial is designed to operate on the two BBC channels 44 (BBC 2) and 51 (BBC 1). Both channels have positive offset.

The other channels allocated to this station are 41 and 47, of which the former will be used by the ITA. Channels 41 and 47 will have negative offset.

Aerial: The aerial comprises six tiers, each of three 4λ panels fed in phase, giving a total radiating length of 24·5λ at Channel 44 and 26·6λ at Channel 51. The panels are mounted in the centres of the faces of a triangular spine having a side of 991 mm (3 ft 3 in.). The whole aerial is protected by a glass-fibre weather shield having an internal diameter of 1·52 m (5 ft). Figs. 2 and 3 show the arrangement of the panels inside the glass-fibre cylinder and Fig. 4 shows the construction of each panel.

The mean height of the aerial is 158·5 m (520 ft) a.g.l.

Feeders: The arrangement of the distribution feeders is shown schematically in Fig. 5. Each half of the aerial is connected to the transmitter by a feeder type Hackethal HF 4.1/8 – 50.

Power: Two 6·25 kW vision transmitters and two 1·25 kW sound transmitters have been installed for operation on Channel 44 (BBC-2). The transmitters are run at the power required to give the maximum effective radiated power (e.r.p.) of 250 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 of the diplexer is divided equally to the two main feeders. This arrangement eliminates effects arising from differences between the modulation characteristics of the vision transmitters.

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 omnidirectional with a maximum e.r.p. of 250 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 Channels 44 and 51 are shown in Figs. 6 and 7 and are the mean of measurements on each half aerial.

Vertical Radiation Pattern (v.r.p.):

The v.r.p. was specified to be null-filled with the maximum of radiation tilted 0·3° ± 0·1° below the horizontal. This is achieved by means of the following distribution of the feed currents over the length of the aerial:

Tier	1 (top)	2	3	4	5	6
Amplitude	0·525	0·526	0·454	0·386	0·272	0·135
Phase (Ch. 44)	18°	11°	4°	–4°	-11°	-18°
(Ch. 51)	20°	12°	4°	–4°	-12°	-20°

The v.r.p.s obtained for each face, shown in Figs. 8 – 10, were computed from measurements of the amplitudes and phases of the feeds to the aerial panels, taken after erection.

Gain:

Channel		44		51
		dB		dB
Mean intrinsic gain		14·5		14·2
Deduct aerial losses	dB		dB	
V.R.P. null-filling	0·6		0·6	
Distribution feeder	0·3		0·3	
Distribution transformers	0·1	1·0	0·1	1·0
Mean net gain		13·5		13·2
Deduct other losses				
Main feeder (including ground run)	1·5		1·5	
Diplexer and splitter	0·1		0·1	
2-Channel combining unit	0·5	2·1	0·5	2·1
Mean effective gain		11·4		11·1
H.R.P. maximum/mean ratio		1·0		1·3
Maximum effective gain		12·4		12·4

Programme feed:

Direct pick-up of Tacolneston using a trough aerial at 105·2 m (345 ft) a.g.l. (main aerial) and a double 14-element Yagi aerial (standby, Channel 55 only) at 103·0 m (338 ft) a.g.l.

ACKNOWLEDGEMENTS

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.

SMW

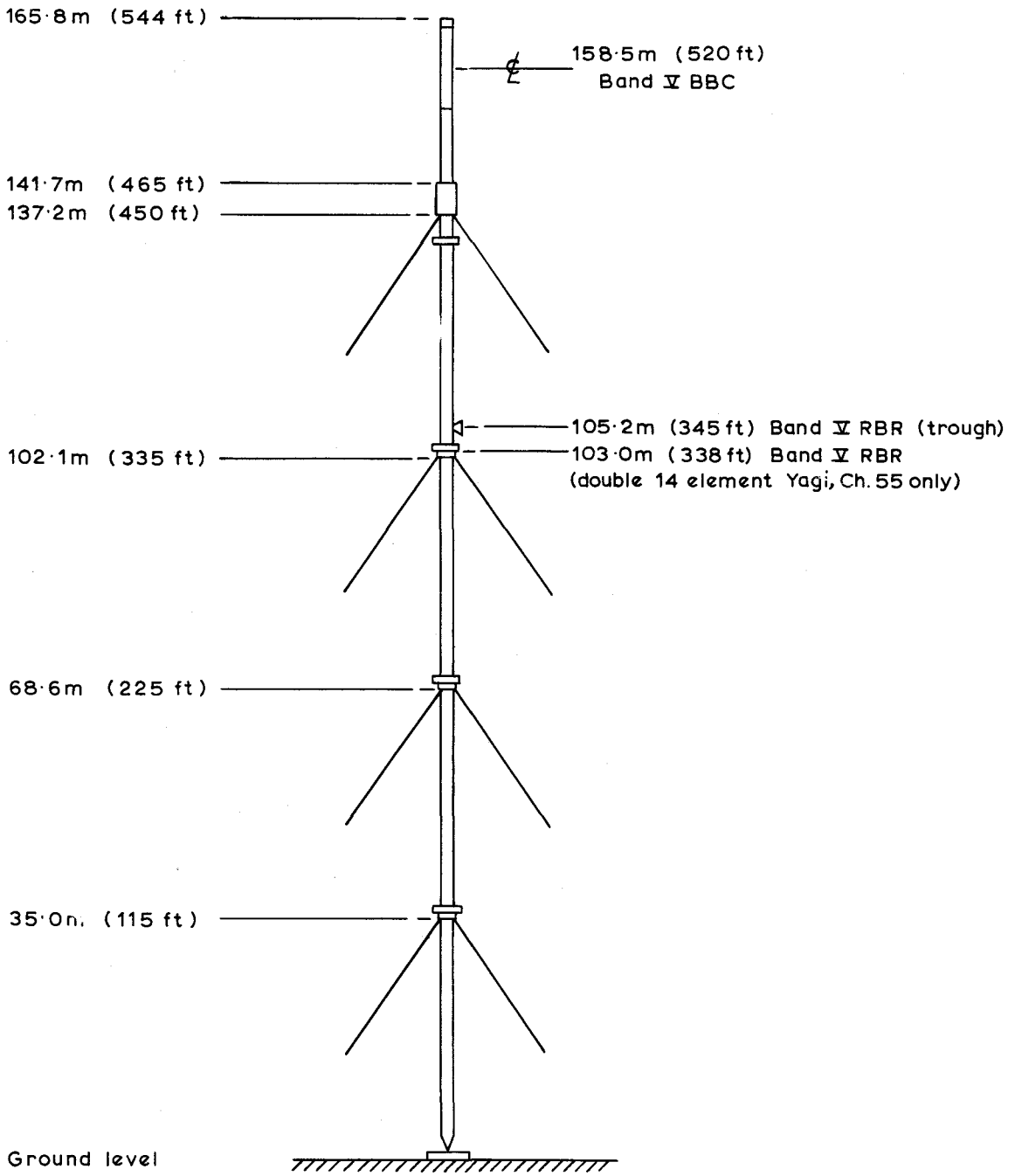

Fig. 1. General arrangement of aerials on mast

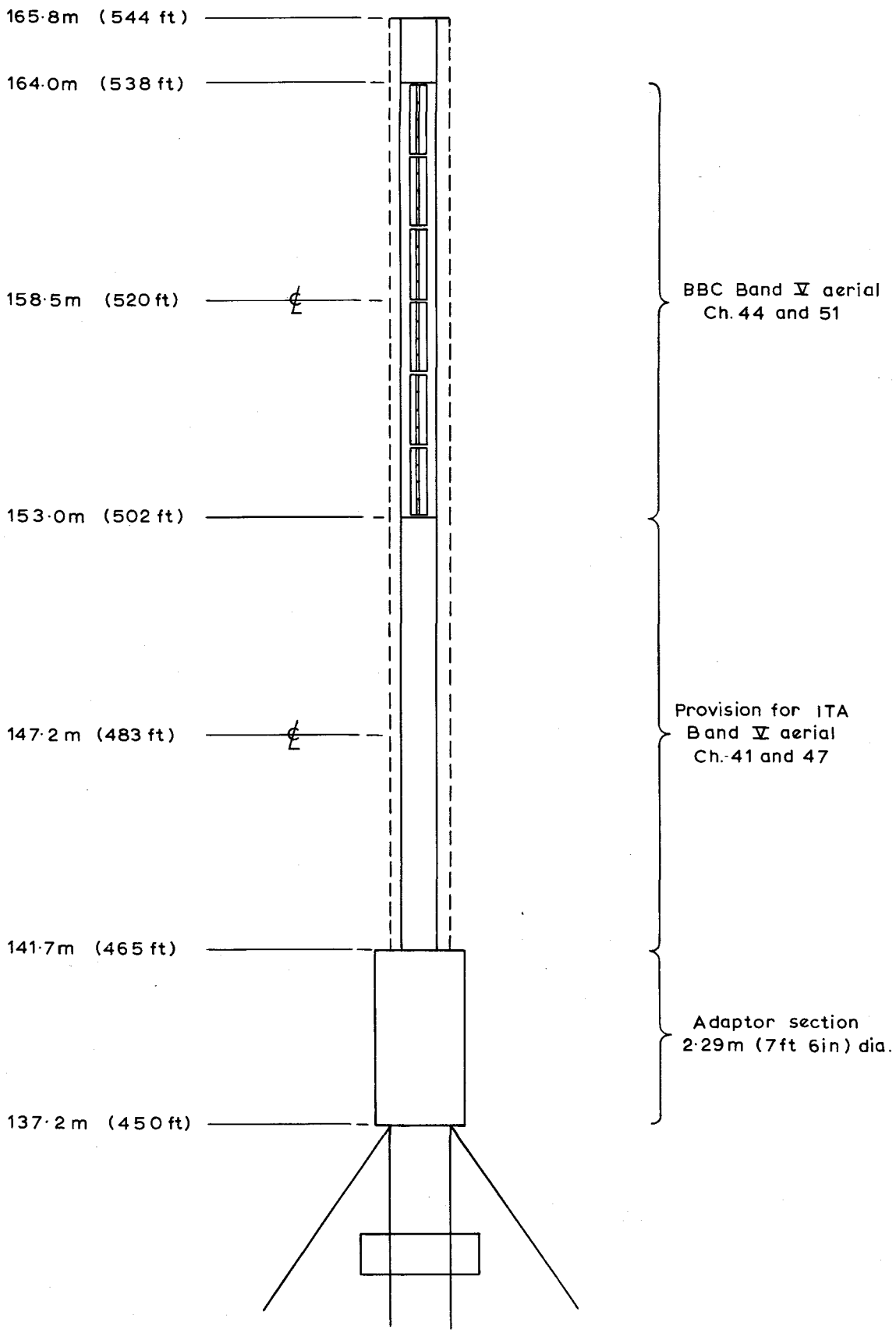

Fig. 2. Elevation of aerial

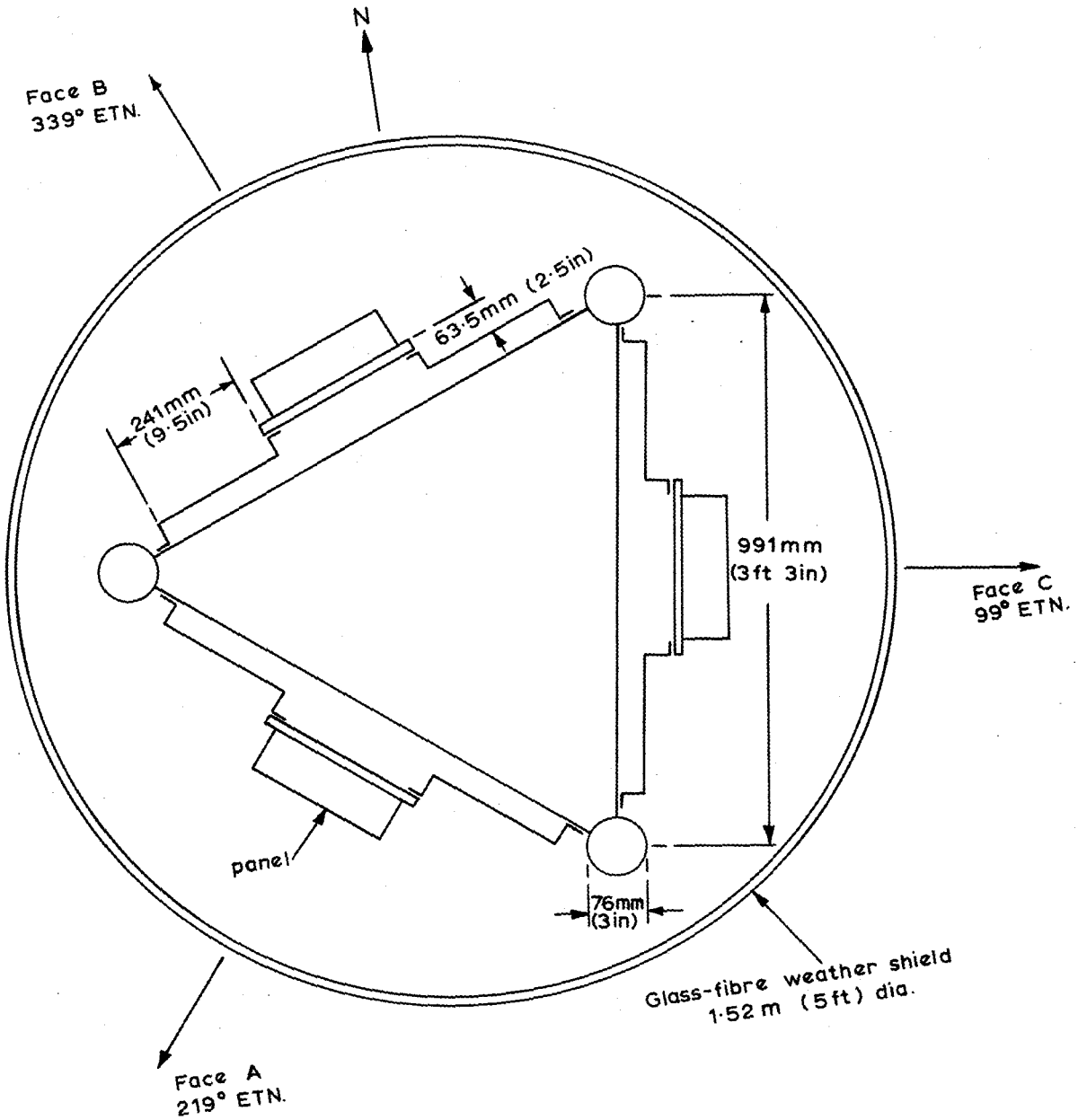

Fig. 3. Plan of aerial.

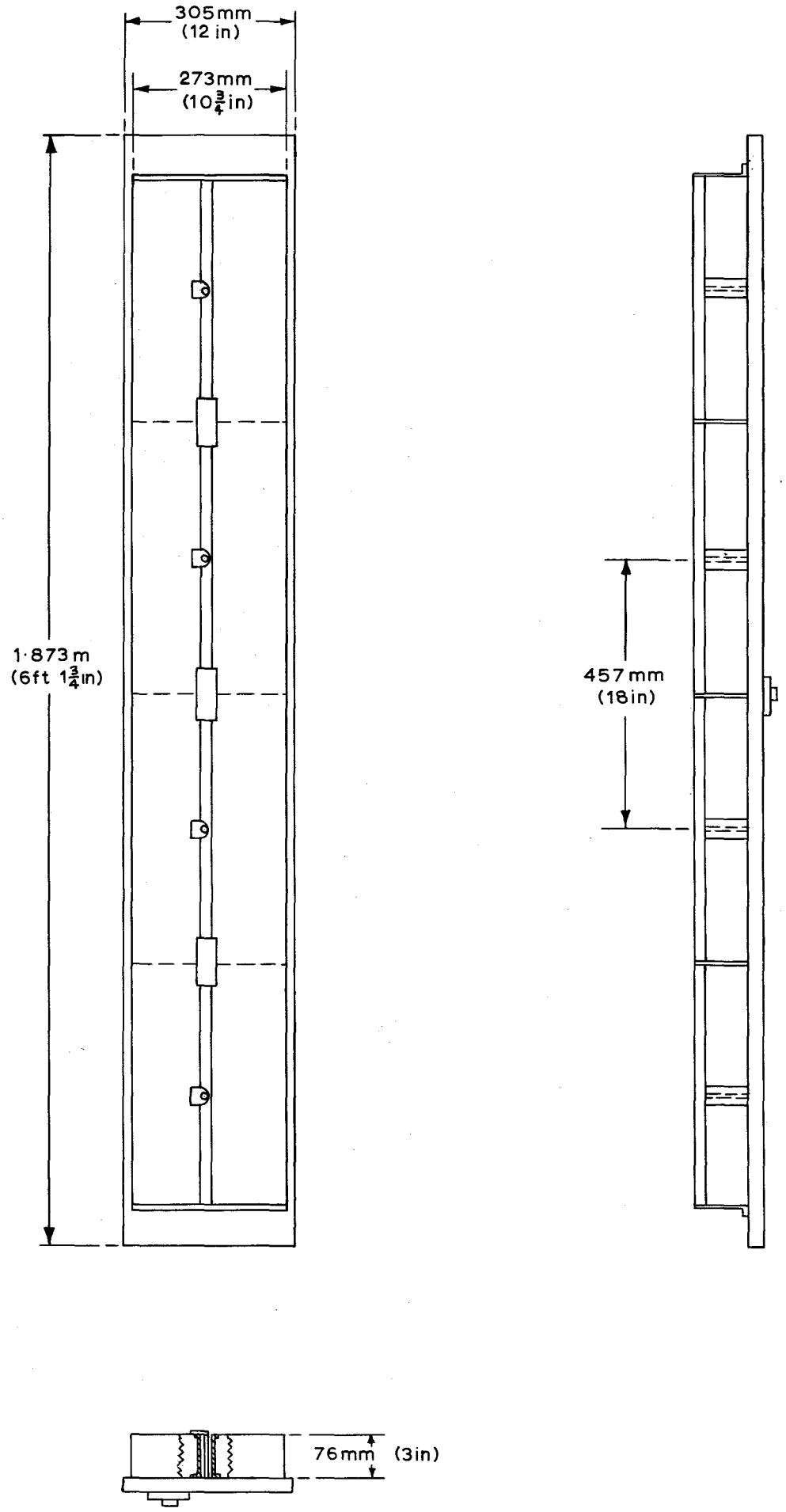

Fig. 4. Construction of aerial panel.

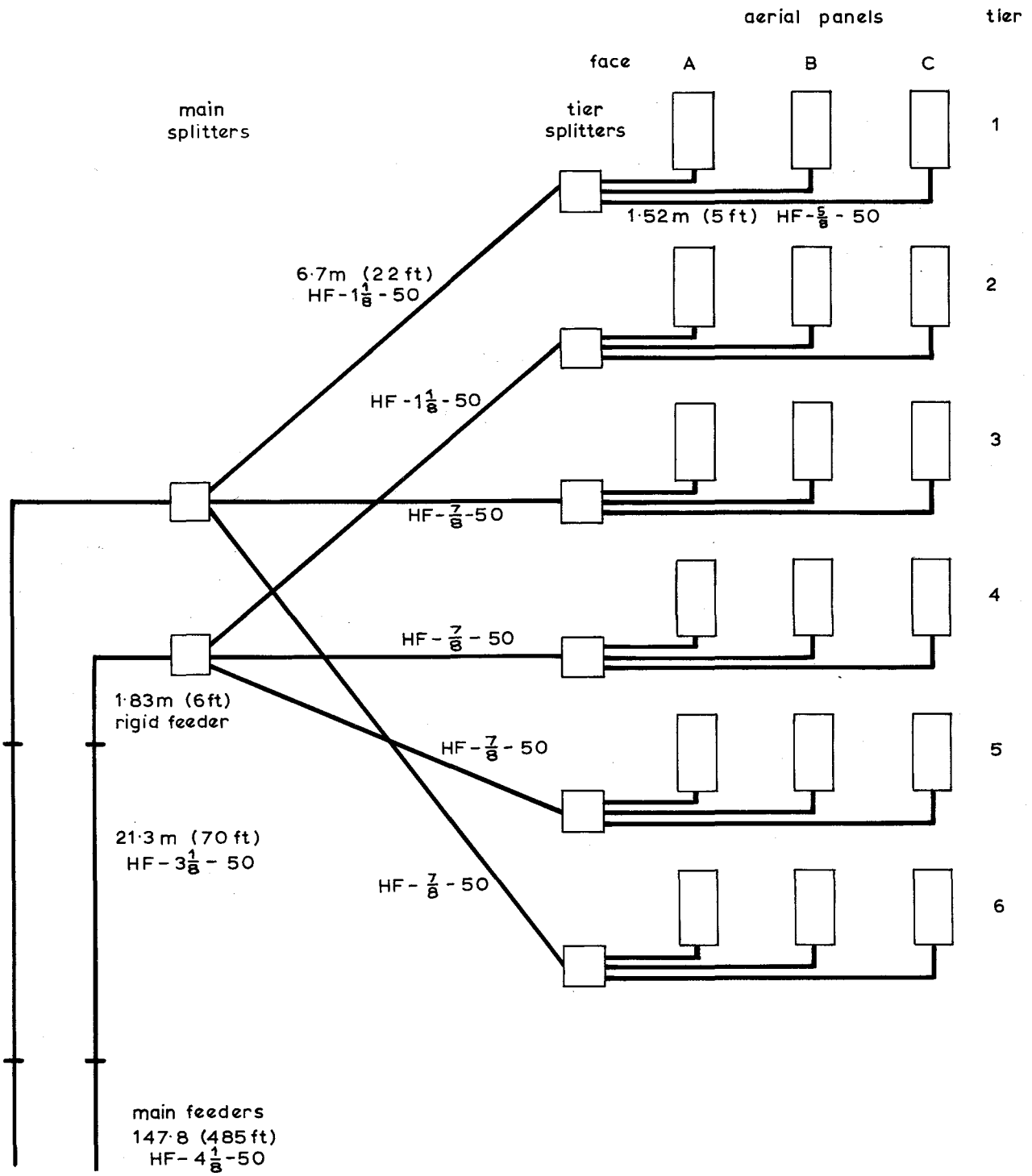

Fig. 5. Schematic arrangement of distribution feeder

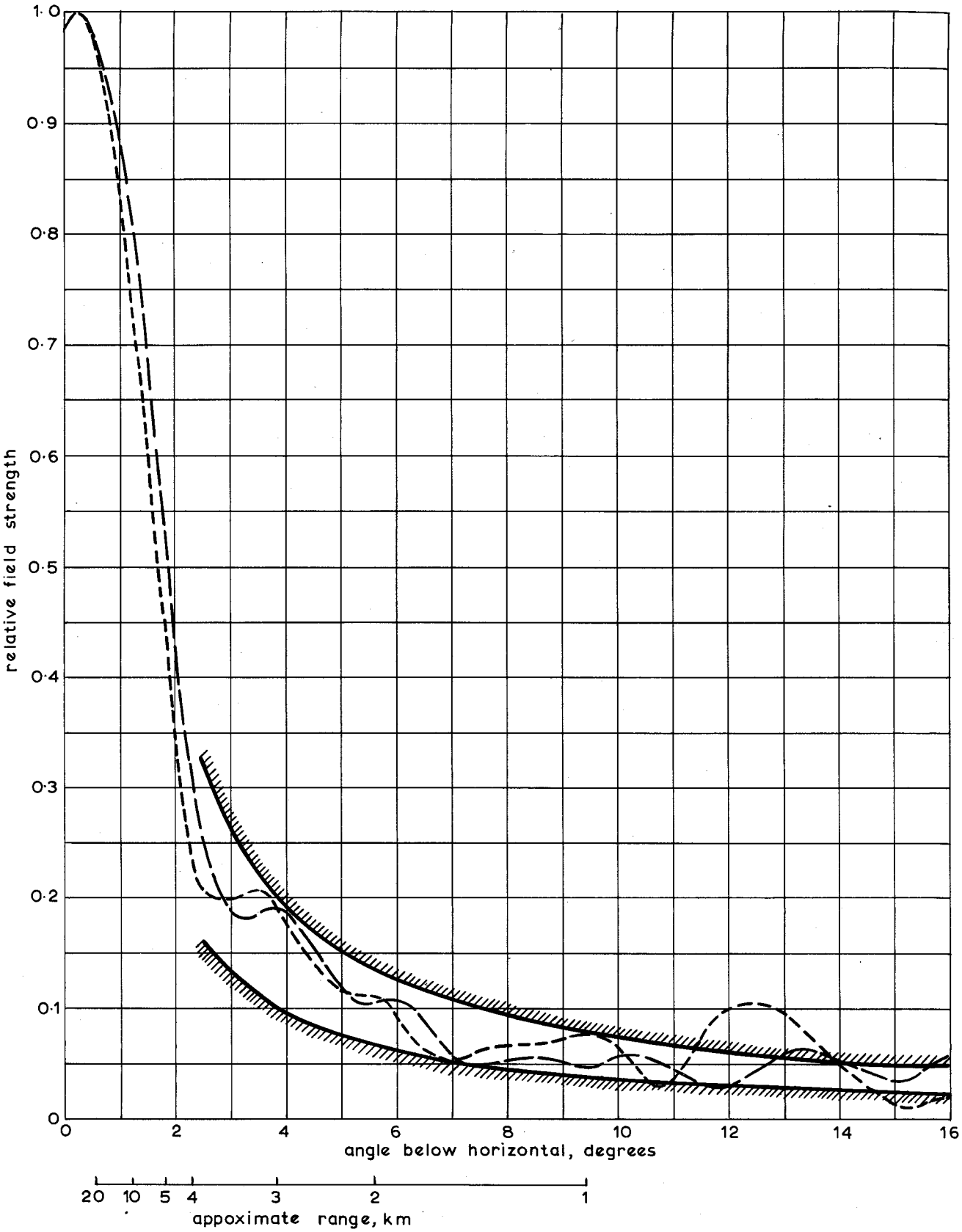

Fig. 8. Vertical radiation pattern on bearing 219° ETN (face A)

—— —— Channel 44 (BBC 2)

---- Channel 51 (BBC 1)

Specified field limits

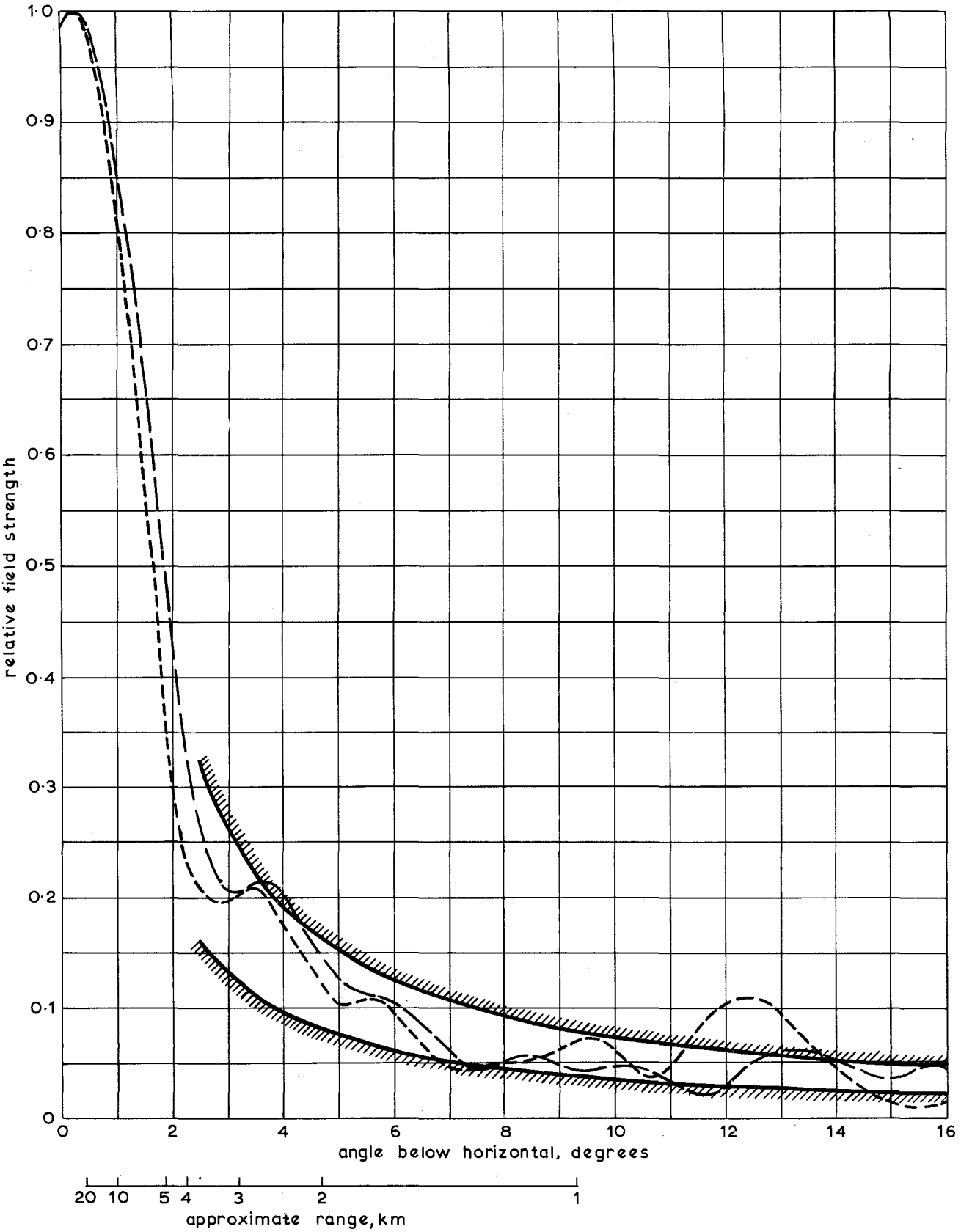

Fig. 9. Vertical radiation pattern on bearing 339° ETN (face B)

——— Channel 44 (BBC 2)

- - - - - - - Channel 51 (BBC 1)

Specified field limits

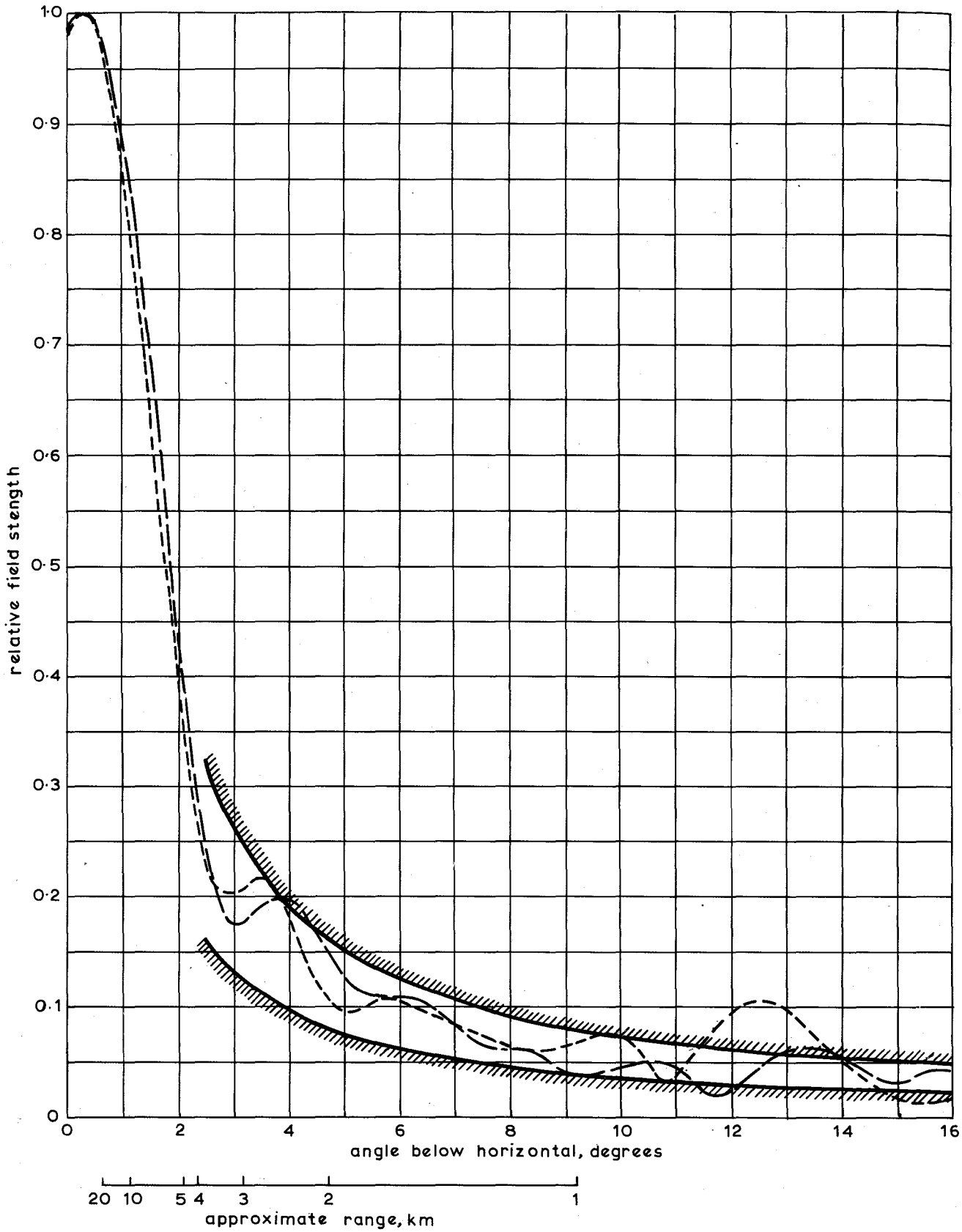

Fig. 10. Vertical radiation pattern on bearing 99° ETN (face C)

—— —— Channel 44 (BBC 2)
- - - - - - - Channel 51 (BBC 1)
Specified field limits

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