RESEARCH DEPARTMENT

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

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INTRODUCTION

A u.h.f. aerial for South Wales has been built as a topmast on the existing 715 ft (218 m) mast at Wenvoe. Space for this aerial was provided by rebuilding the Band I aerial on the support column of the mast.[1] The new aerial came into service on 12th September 1965.

SUMMARY OF INSTALLATION

Site: The site is 5 miles (8 km) west-south-west of Cardiff, grid reference ST/111742, height 422 ft (129 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 84°, 204° and 324° ETN.

General Arrangement: See Fig. 1.

Channels: The aerial is designed to radiate on four channels simultaneously. The BBC channels are 44 and 51, of which the latter is used for the opening service. The ITA channels are 41 and 47.

The offset on Channel 44 is positive and that on Channel 47 is negative; Channels 41 and 51 have zero offset.

Aerial: The aerial[2] comprises six tiers each of four 4λ panels fed with nominally equal amplitude currents in phase rotation, to give a total radiating length varying between 20·5λ and 23·2λ over the operating bandwidth. The panels are offset on a square of 26 in. (0·66 m) side and are supported by a load-bearing glass-fibre cylinder of 5 ft (1·52 m) diameter. Fig. 2 shows the arrangement of the panels inside the glass-fibre cylinder and Fig. 3 shows the construction of each panel.

The arrangement of the distribution feeder is shown schematically in Fig. 4. Each half of the aerial is connected to the transmitter by a feeder type F and G 6.1/8 - 50. The mean height of the aerial is 736 ft 6 in. (224·5 m) a.g.l.

Power:

Two 25 kW vision transmitters and two 5 kW sound transmitters will be provided for each channel; at present only those for Channel 51 have been installed. Each transmitter will be underrun at the power required to give the maximum e.r.p. permitted under the Stockholm Agreement, namely 500 kW.

The service has opened with one vision and one sound transmitter fed into each half aerial but at a later date a diplexer and splitting transformer will be added to eliminate differences between the modulation characteristics of the vision transmitters. Similarly, two- and four-channel combining units 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. not exceeding 500 kW. The specified tolerance on the h.r.p. uniformity was ± 2 dB. The h.r.p.s at the vision carrier frequency of each operational channel, which are shown in Figs. 5-8, are the mean of measurements made at the contractors test site on each half of the full-scale aerial, i.e. it is assumed that the contributions from each half-aerial add in phase in all directions of azimuth.

The orientation of the aerial was chosen to give the best overall service cover, bearing in mind v.r.p. deficiencies.

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

The v.r.p. was specified to be gapfilled with the maximum of radiation tilted 0·5° below the horizontal. Gapfilling is achieved by means of a phase distribution of the feed currents over the length of the aerial together with a physical tilt of the panels in Tier 1. 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 aerial panels, taken after erection.

Gain:

Channel	41 dB	44 dB	47 dB	51 dB
Mean intrinsic gain	14·0	14·1	14·3	14·4
Deduct losses				
Distribution feeder	0·2	0·2	0·2	0·2
Distribution transformer	0·1	0·1	0·1	0·1
Power in balance load	0·1	0·1	0·1	0·1
Gapfilling	0·7 1·1	0·7 1·1	0·7 1·1	0·7 1·1
Mean net gain	12·9	13·0	13·2	13·3

Deduct losses								
Main feeder, 757 ft (231 m)	1·4		1·4		1·4		1·5	
Feeder ground run	0·2		0·2		0·2		0·2	
Diplexer	0·1		0·1		0·1		0·1	
Splitting transformer	0·1	1·8	0·1	1·8	0·1	1·8	0·1	1·9
Mean effective gain		11·1		11·2		11·4		11·4
H.R.P. maximum/mean ratio		2·1		1·9		1·9		2·2
Maximum effective gain		13·2		13·1		13·3		13·6

Programme feed: GPO link.

ACKNOWLEDGEMENTS

The mechanical and electrical design, construction and setting to work of the aerial were carried out by the Marconi Co. Ltd. The contracting authority was the BBC Planning and Installation Department.

REFERENCES

1. 'New Band I Transmitting Aerial for the Wenvoe Television Station', Research Department Technological Report No. E-114/11.

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

Band V Panel Aerial: Marconi drawing T80-2295

Assembly similar to: Marconi drawing BT02-8240, Sheets 1 and 2

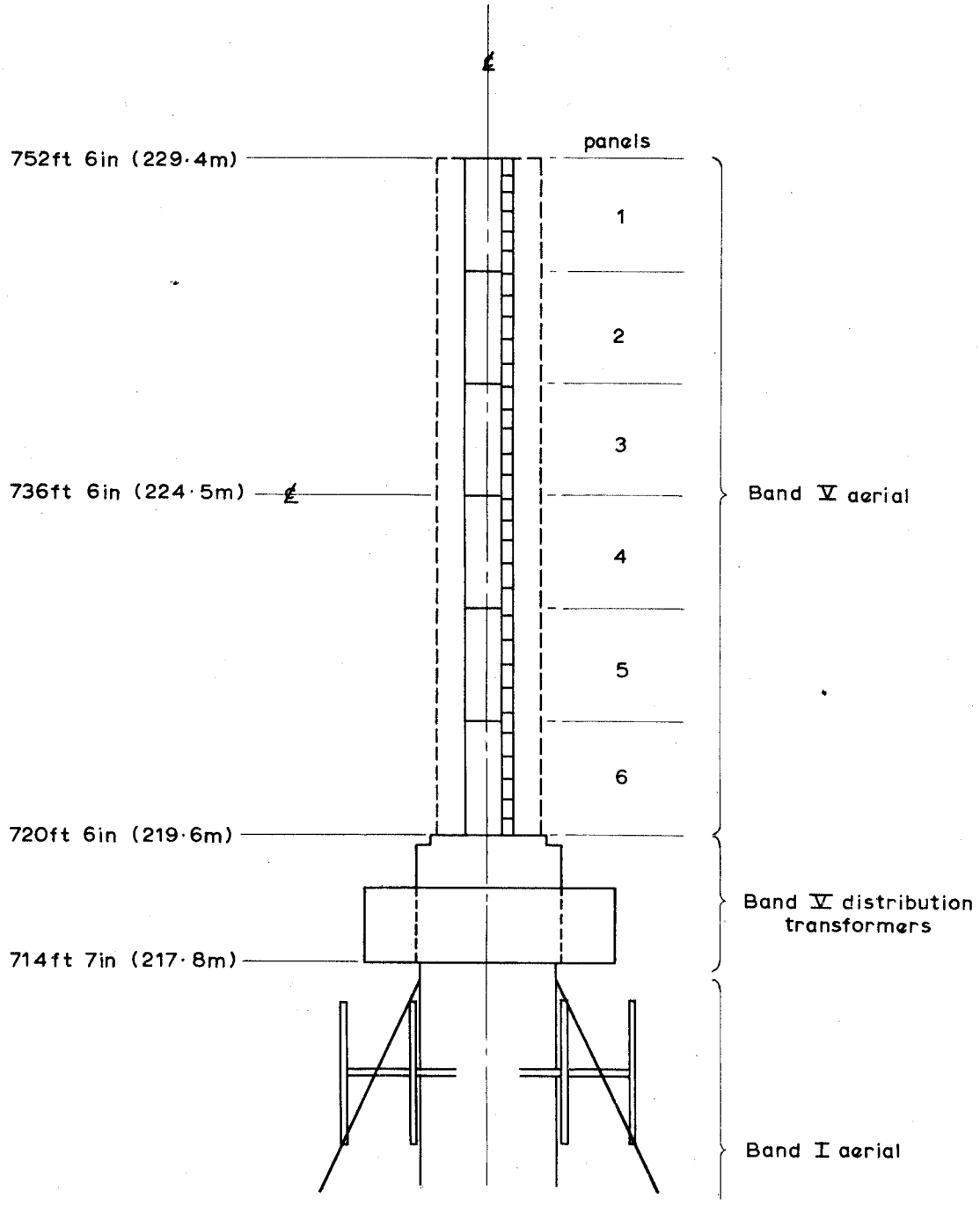

Fig. 1. General arrangement of aerials on mast

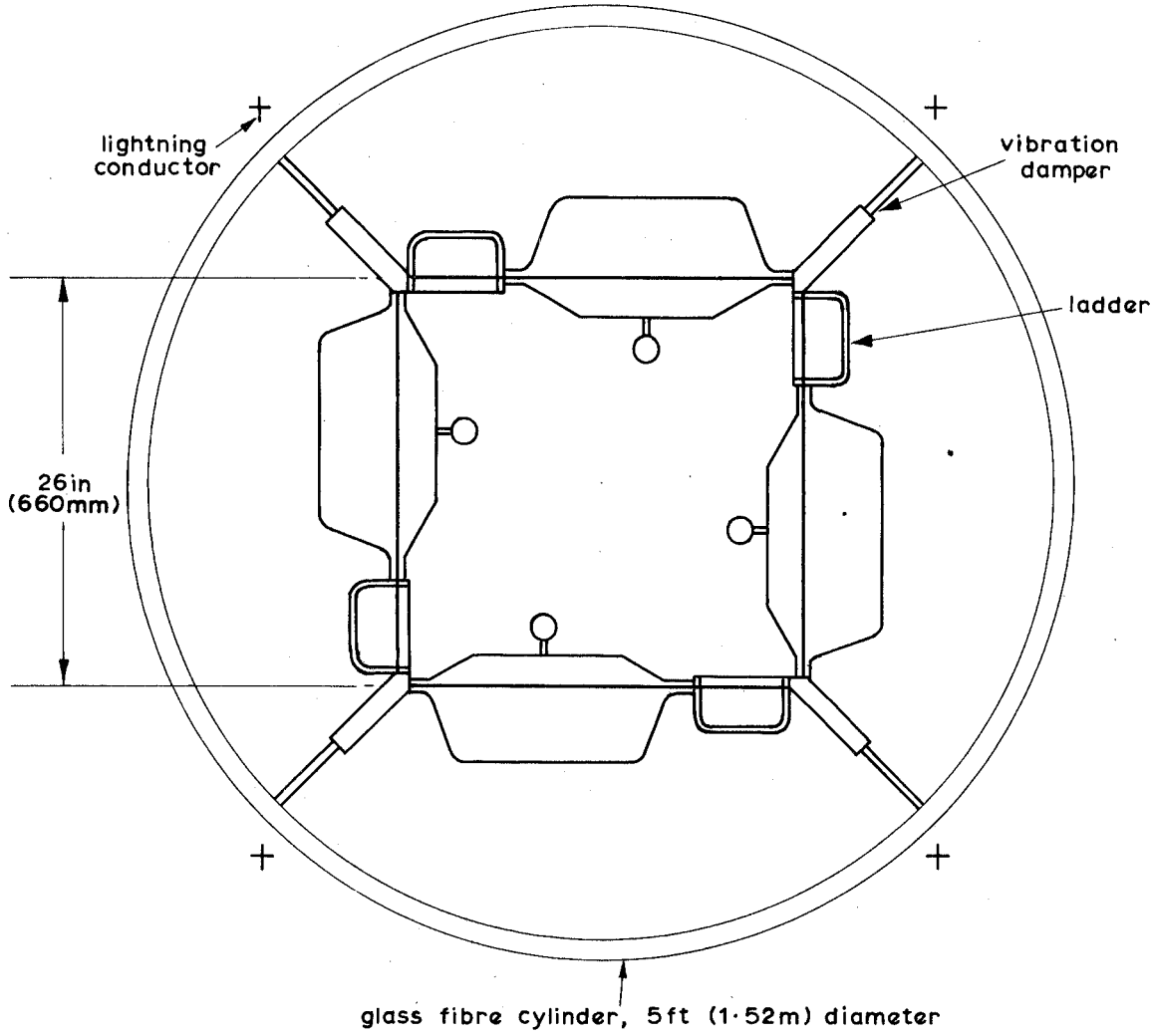

Fig. 2. Arrangement of aerial panels.

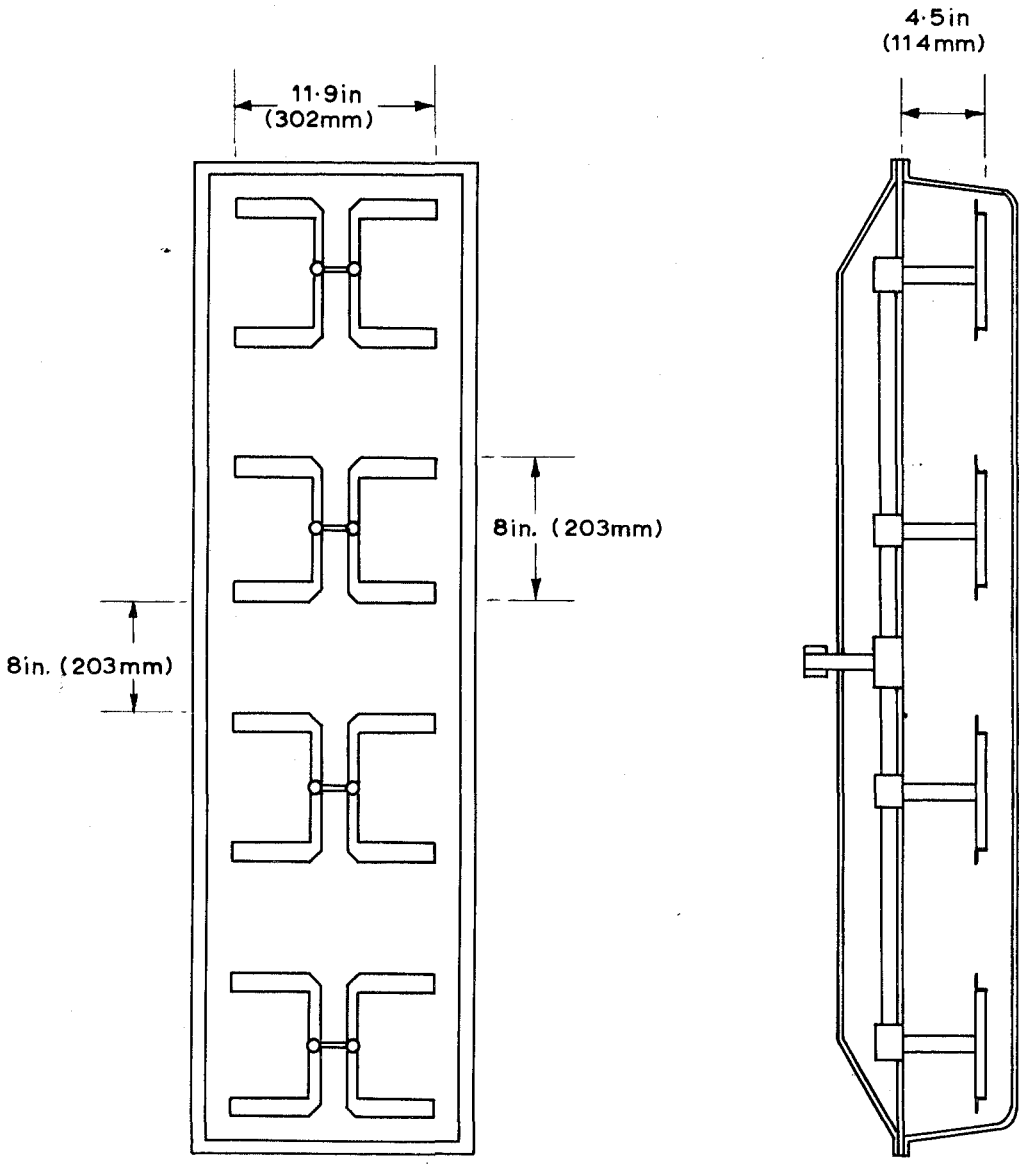

Fig. 3. Construction of single panel.

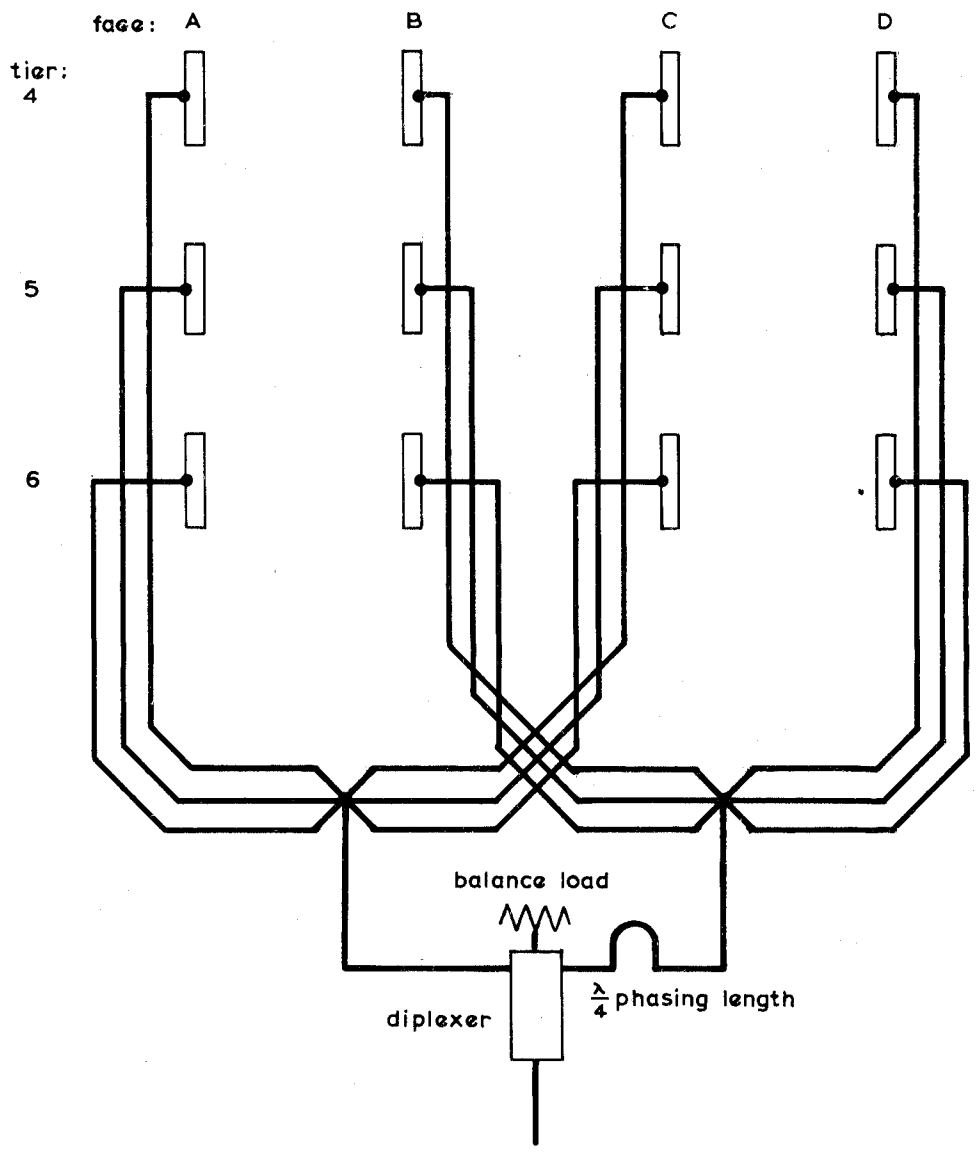

Fig. 4. Schematic of distribution feeder arrangement (lower half aerial)

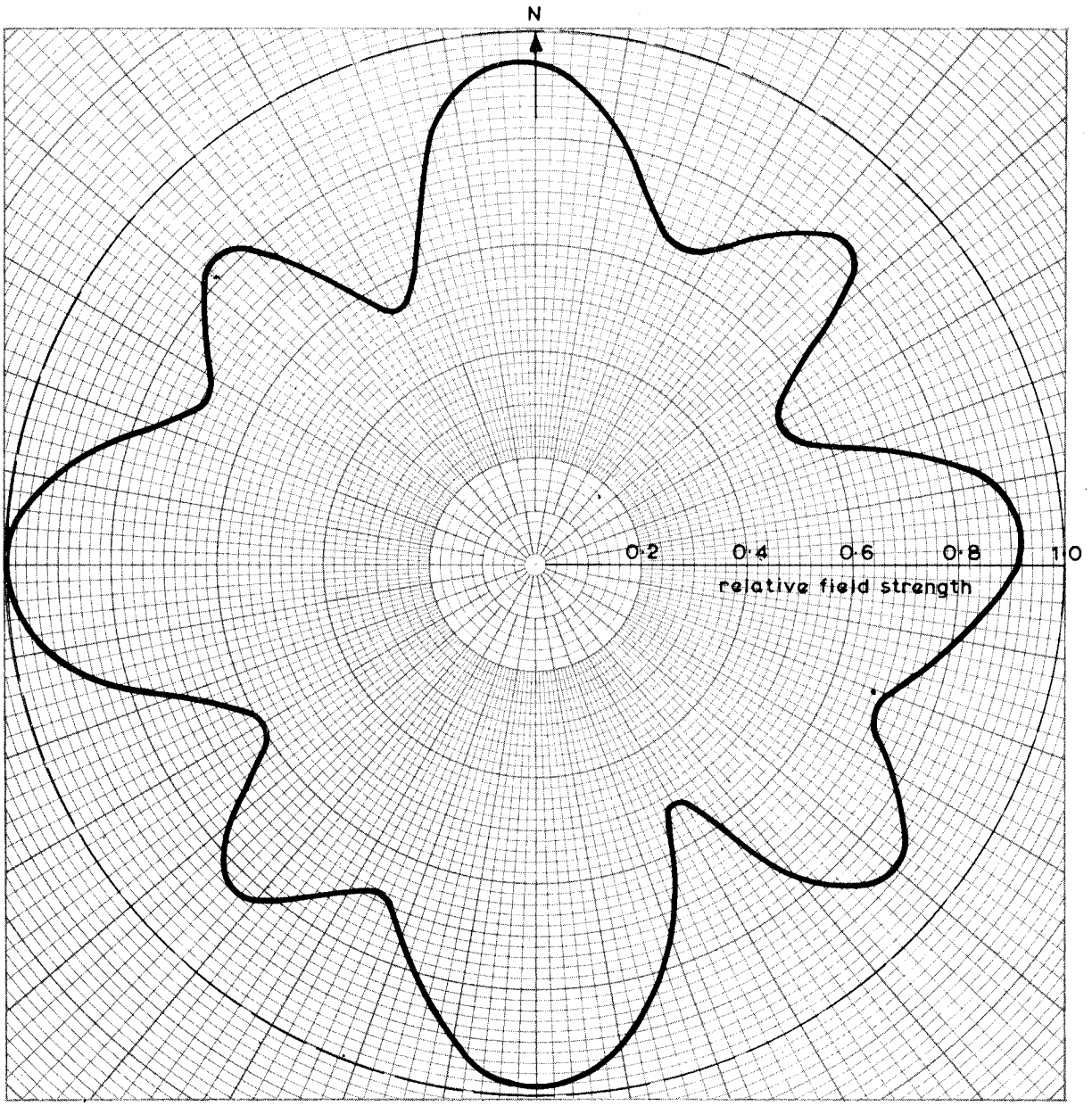

Fig. 5. Horizontal radiation pattern: Channel 41

HORIZONTAL POLARIZATION

Vision carrier 631·25Mc/s, Sound carrier 637·25Mc/s

Mean effective gain: 11·1 dB

Peak vision transmitter power: 2 x 12kW

Mean E.R.P: 310kW

—— —— Stockholm E.R.P. limit

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

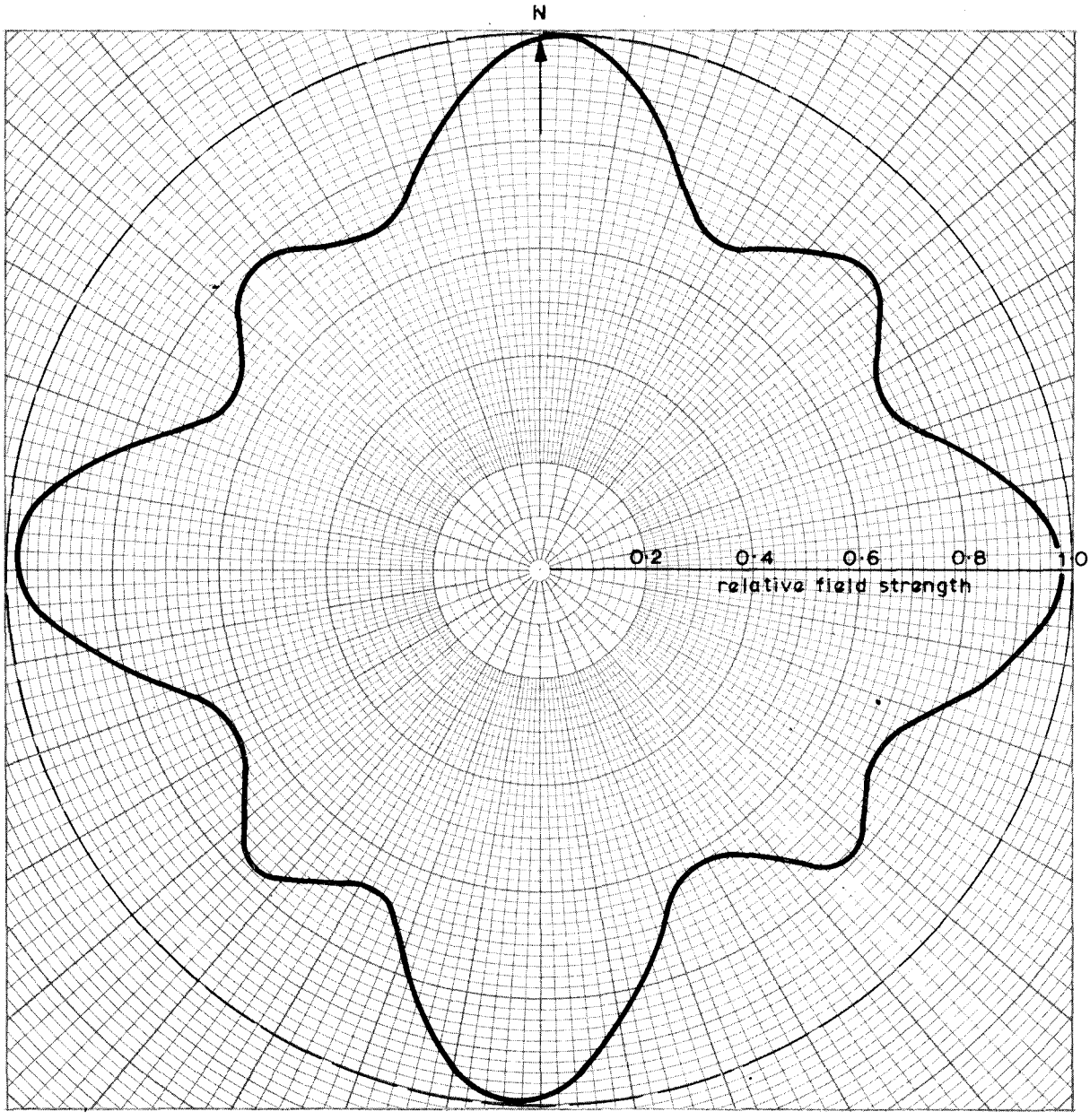

Fig. 6. Horizontal radiation pattern: Channel 44

HORIZONTAL POLARIZATION

Vision carrier 655·25Mc/s, Sound carrier 661·25Mc/s

Mean effective gain: 11·2dB

Peak vision transmitter power: 2 x 12kW

Mean E.R.P: 320kW

——— Stockholm E.R.P. limit

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

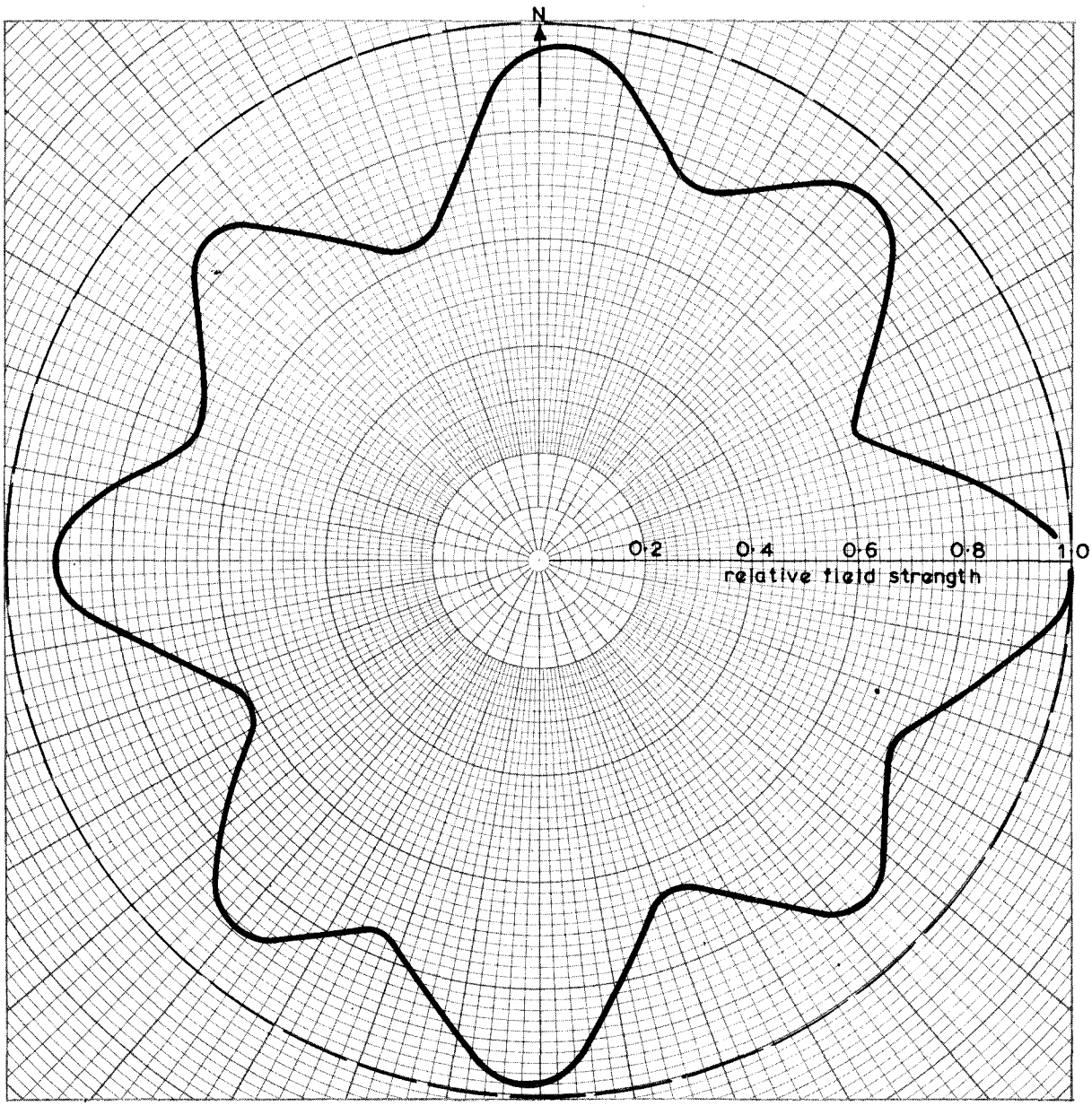

Fig. 7. Horizontal radiation pattern: Channel 47

HORIZONTAL POLARIZATION

Vision carrier 679·25Mc/s, Sound carrier 685·25Mc/s

Mean effective gain: 11·4dB

Peak vision transmitter power: 2 x 12kW

Mean E.R.P. 330kW

—— —— Stockholm E.R.P. limit

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

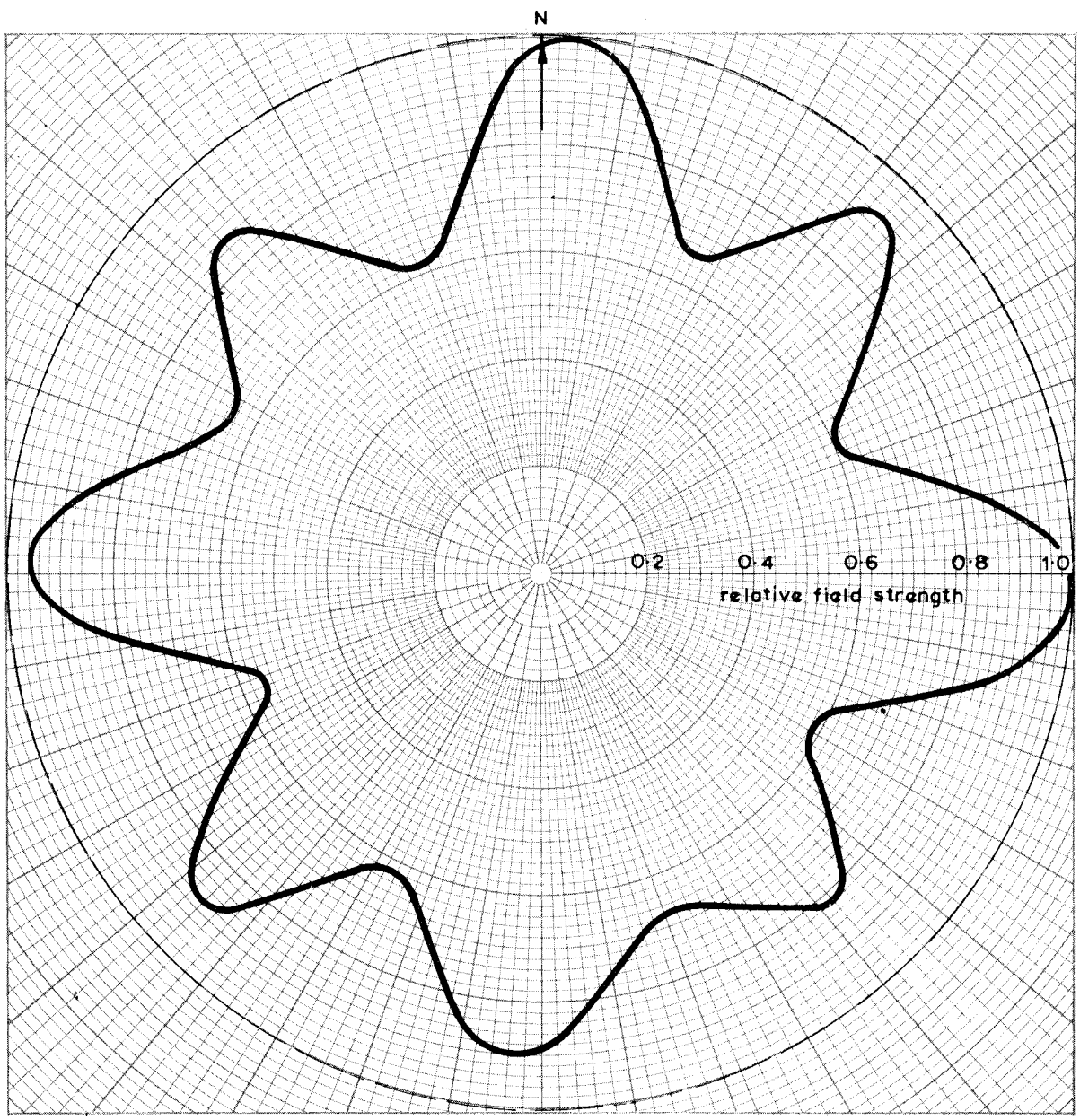

Fig. 8. Horizontal radiation pattern: Channel 51

HORIZONTAL POLARIZATION

Vision carrier 711·25Mc/s, Sound carrier 717·25Mc/s

Mean effective gain: 11·4 dB

Peak vision transmitter power: 2 x 11kW

Mean E.R.P.: 300kW

—— —— Stockholm E.R.P. limit

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

Fig. 9. Vertical radiation pattern on bearing 0° E.T.N.

Channel 41 — Channel 44

Channel 47 — Channel 51

Specified minimum field

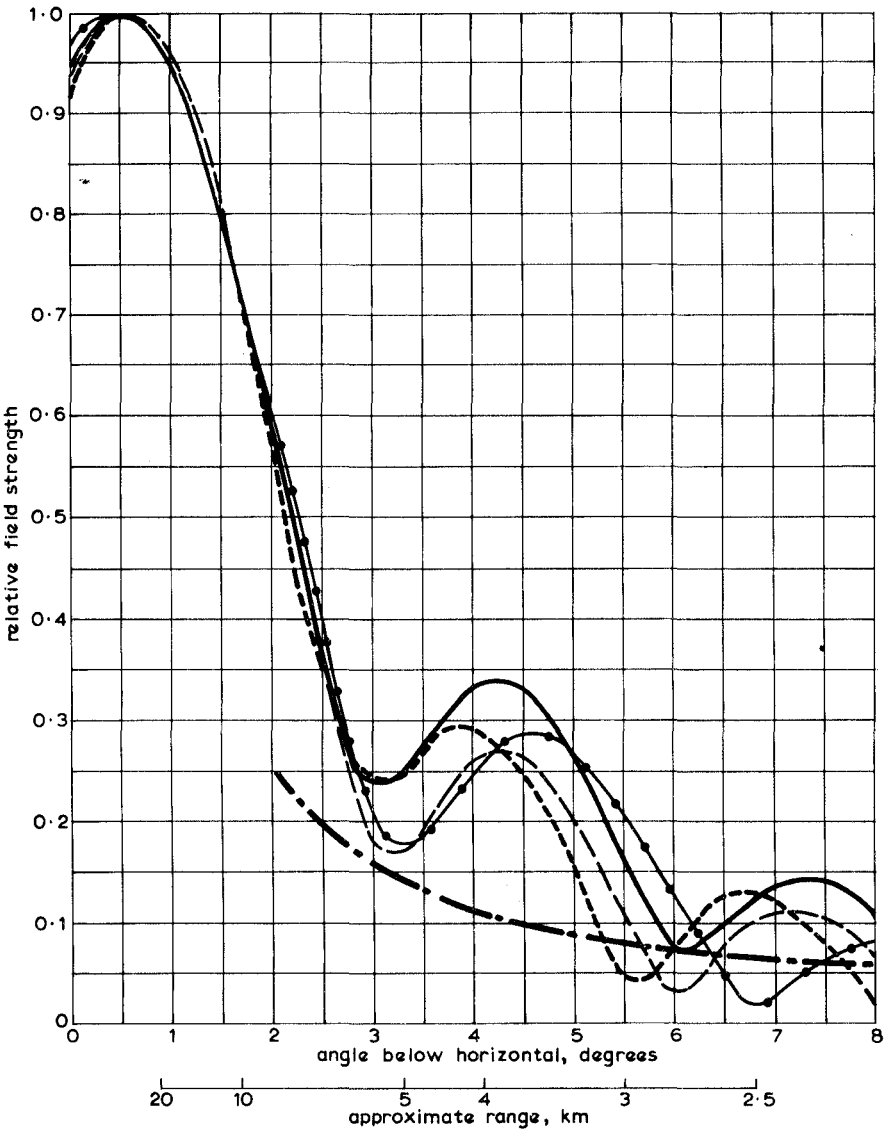

Fig. 10. Vertical radiation pattern on bearing 90° E.T.N.

Channel 41 — Channel 44

Channel 47 — Channel 51

Specified minimum field

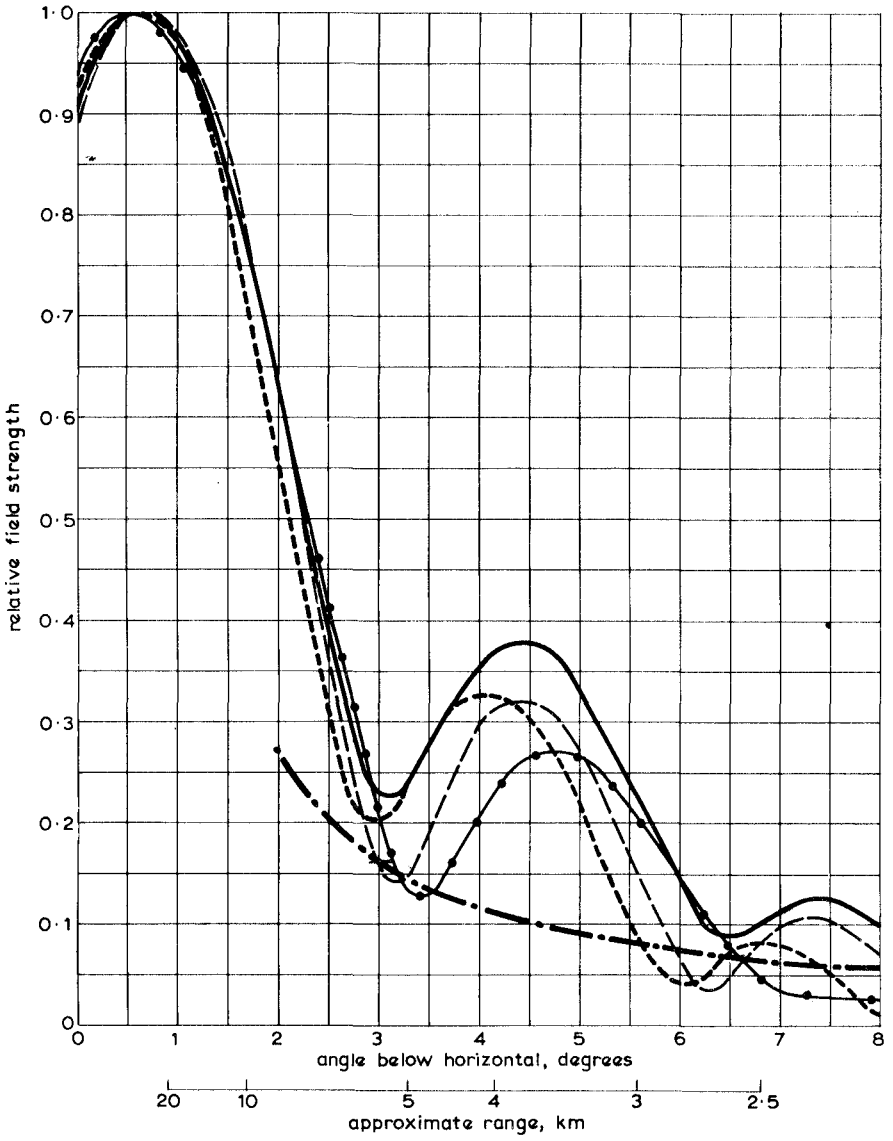

Fig. 11. Vertical radiation patterns on bearing 180° E.T.N.

Channel 41 — Channel 44

Channel 47 — Channel 51

Specified minimum field

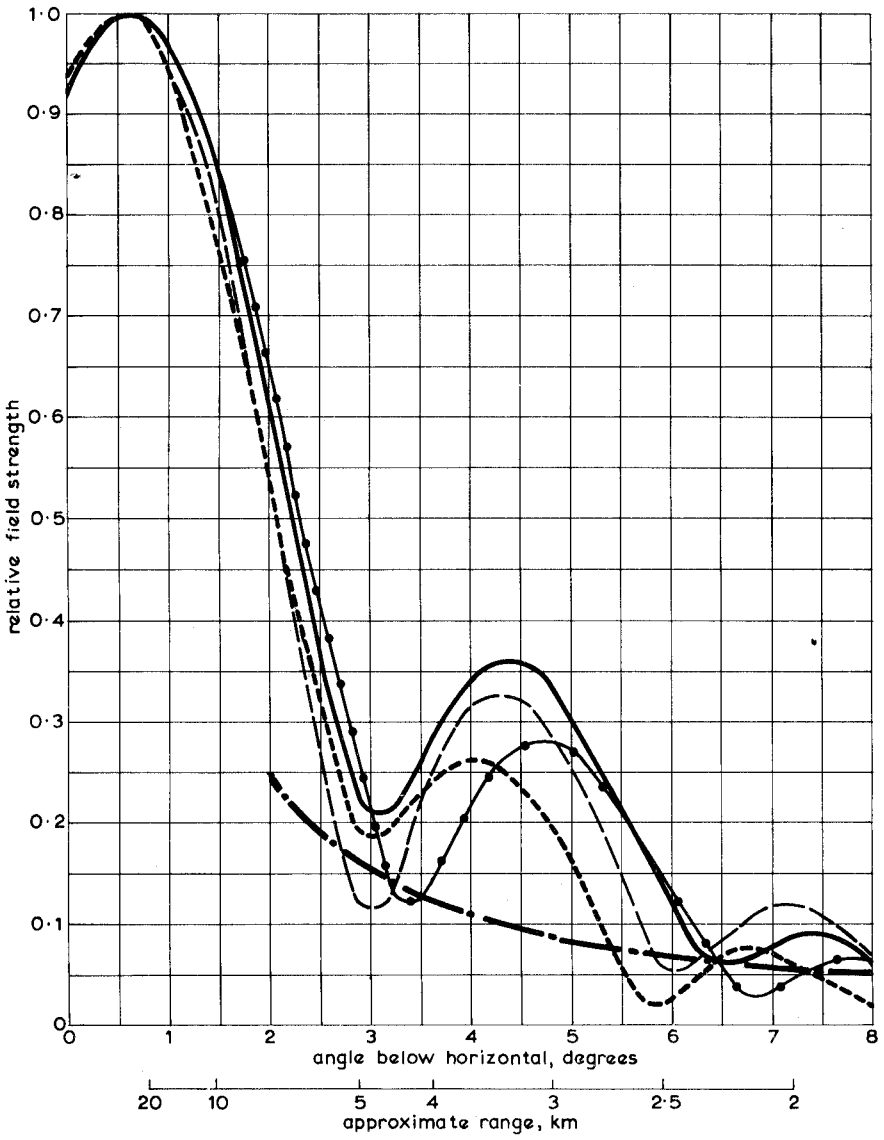

Fig. 12. Vertical radiation patterns on bearing 270° E.T.N.

Channel 41 — Channel 44

Channel 47 — Channel 51

Specified minimum field

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