RESEARCH DEPARTMENT

THE SERVICE AREA OF THE NORTH HESSARY TOR TELEVISION TRANSMITTER

Report No. K-143

(1960/5)

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SUMMARY

The service area of the North Hessary Tor television transmitter conforms well with that predicted from site test measurements. South Devon is very well served, North Devon is partly served by North Hessary Tor, and in the extreme north by Wenvoe. Reception of North Hessary Tor is poor in parts of south-west Cornwall but these areas will be served by the proposed West Cornwall satellite transmitter.

1. INTRODUCTION

The North Hessary Tor television transmitter is situated on Dartmoor, approximately 13 miles (21 km) north-north-east of Plymouth. The site is 1675 ft (511 m) above mean sea level. Transmissions started on 12th December 1954. Initially, the service was provided by a temporary low-power (0·5 kW) transmitter and a temporary aerial mounted 130 ft (39·6 m) above ground level. The horizontal radiation pattern (h.r.p.) of the temporary aerial was such that the effective radiated power (e.r.p.) varied from 0·08 kW to 1·4 kW. On 5th February 1956 the 5 kW transmitter came into service and the e.r.p. was increased to 0·4–7·0 kW. Finally, on 22nd May 1956, the four-stack aerial, each stack consisting of one vertical dipole, mounted 633 ft (193 m) above ground level, came into service and the e.r.p. was increased to 1·5–27·5 kW. The transmission is on Channel 2 (vision frequency = 51·75 Mc/s; sound frequency = 48·25 Mc/s).

2. RESULTS

The results are presented in a field strength contour map (T.512), Fig. 1, while details of the field strength in towns surveyed, with a population of 1000 or more, are given in Appendix I. The contours of geographically adjacent transmitters have been omitted from Fig. 1 in the interests of clarity. It will be seen that the service area in North Devon, Somerset and East Dorset is restricted for at least 10% of the time by co-channel interference, mainly from Holme Moss. Parts of East Dorset and West Devon are best served by North Hessary Tor but are also subject to co-channel interference. The north coast of Cornwall from Newquay to Boscastle, and parts of West Cornwall, are also subject to co-channel interference. Viewers in these areas are, of course, without an alternative source of programme, but when the proposed West Cornwall transmitter comes into service south-west Cornwall will get a much improved service. Unfortunately, it will not help viewers in the Newquay/Boscastle areas.

Fig 1

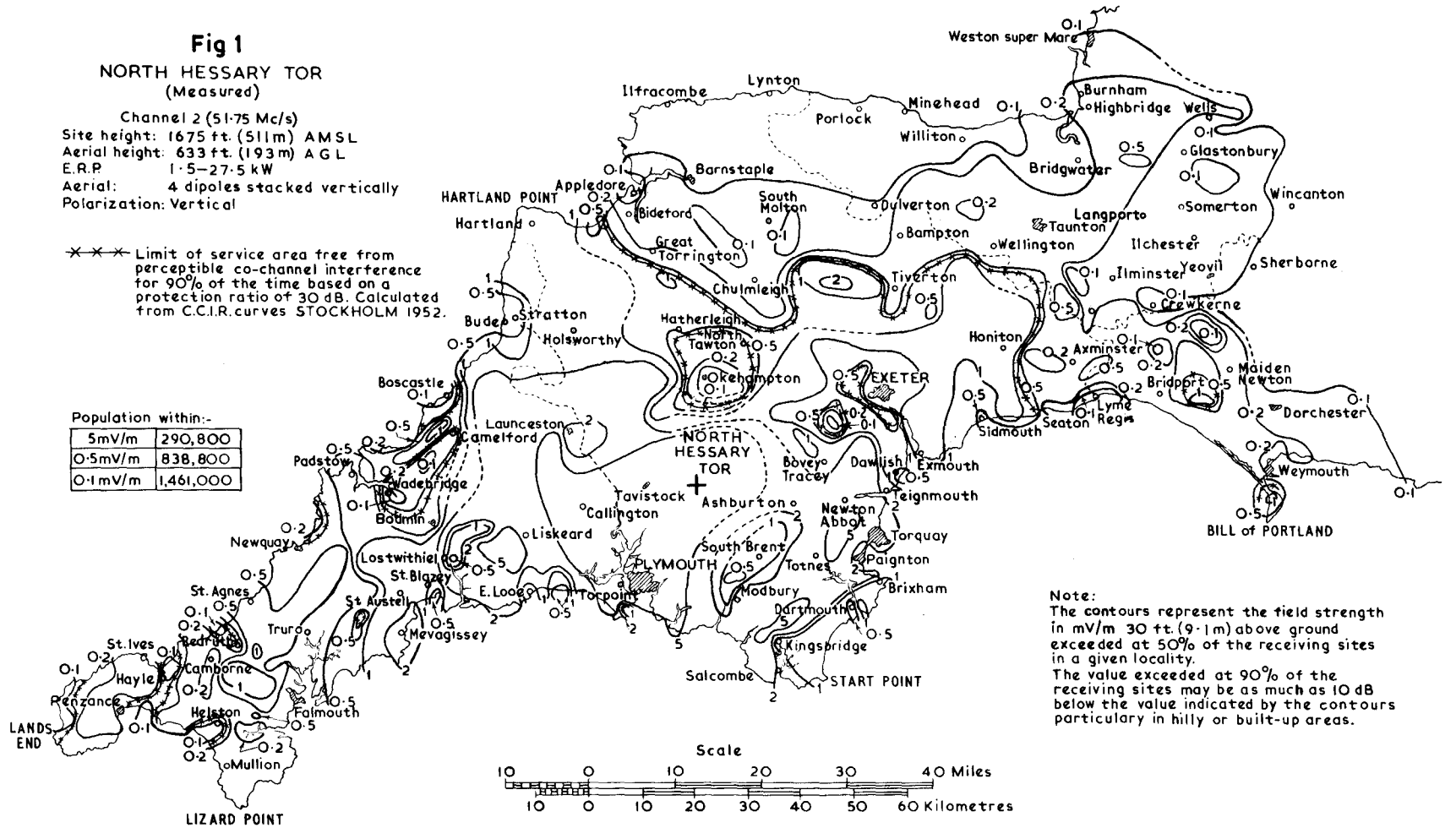
NORTH HESSARY TOR
(Measured)

Channel 2 (51·75 Mc/s)
Site height: 1675 ft. (511m) AMSL
Aerial height: 633 ft. (193m) AGL
E.R.P. 1·5–27·5 kW
Aerial: 4 dipoles stacked vertically
Polarization: Vertical

Limit of service area free from perceptible co-channel interference for 90% of the time based on a protection ratio of 30 dB. Calculated from C.C.I.R. curves STOCKHOLM 1952.

Population within:-

5mV/m	290,800
0·5mV/m	838,800
0·1mV/m	1,461,000



Scale

10 0 10 20 30 40 Miles
10 0 10 20 30 40 50 60 Kilometres

Note:
The contours represent the field strength in mV/m 30 ft. (9·1m) above ground exceeded at 50% of the receiving sites in a given locality.
The value exceeded at 90% of the receiving sites may be as much as 10 dB below the value indicated by the contours particulary in hilly or built-up areas.

Reference to Research Department Report No. K-090[1] shows that all of Somerset and the coastal strip of North Devon are well served by Wenvoe.

The terrain in Cornwall and Devon being very hilly, there are inevitably small areas, inside the general service area, which are subject to severe local screening. These include Wadebridge, Camelford, Bodmin and Okehampton. The latter town is severely screened by Dartmoor and most viewers here take their programme from Wenvoe.

With these exceptions the North Hessary Tor transmitter provides an adequate service to most of Cornwall and South Devon. Of the large towns, Plymouth (7·0 mV/m), Torquay (3·7 mV/m) and Paignton (1·1 mV/m) are all well served. The median field strength in Exeter is 0·8 mV/m but the 90% location value (0·2 mV/m) is rather low.

It is appropriate to mention in this report interference of an unusual nature first reported by viewers on the west side of Plymouth Sound when North Hessary Tor came into full service. The interference takes the form of rhythmic variations in signal amplitude with a periodicity of about 0·6 cycles per second, accompanied by a series of echoes which stretch across the viewing screen. When the interference is severe the synchronising pulses are so blurred as to cause the picture to break-up. This interference, known as "sea-scatter interference" or, as has been suggested, "isostematic reflection", has been investigated by Research Department and is described and theoretically examined elsewhere.[2] The villages on or near Plymouth Sound most affected by this sea-scatter interference are Kingsand, Cawsand and Downderry. A brief description of the circumstances in which the interference manifests itself and of methods of alleviating it is given in Appendix II, but experience has shown that it is extremely difficult, if not impossible, to reduce the interference to acceptable proportions at some locations in the Plymouth Sound area.

3. CONCLUSIONS

The North Hessary Tor television transmitter serves most of Cornwall and Devon. That part of Devon which is beyond the service area of North Hessary Tor is served by Wenvoe. West Cornwall will get a much improved service when the proposed West Cornwall satellite station comes into operation.

Sea-scatter interference in the Plymouth Sound area is so severe at some locations that it is considered not to be possible for some viewers to reduce the level of interference to acceptable proportions.

4. REFERENCES

1. "The Service Area of the Wenvoe Transmitter", Research Department Report No. K-090, Serial No. 1952/24.

2. "Observations on the Interference to the Television Transmission from North Hessary Tor, Caused by Back-scatter from the Sea", Research Department Report No. K-129, Serial No. 1957/24.

APPENDIX I

Field Strength in mV/m at 30 ft (9·1 m) A.G.L.

E.R.P. = 1·5–27·5 kW

Town	Field strength exceeded at stated percentage locations		
	10%	50%	90%
Ashburton	4·2	2·5	0·9
Axbridge	0·3	0·18	0·13
Axminster	1·0	0·4	0·16
Bampton	0·38	0·22	0·14
Barnstaple	0·17	0·09	0·06
Beaminster	0·22	0·14	0·09
Bere Regis	0·13	0·08	0·05
Bideford	0·28	0·13	0·06
Bishop's Lydeard	0·5	0·45	0·32
Bishop's Tawton	0·32	0·2	0·12
Bodmin	0·6	0·2	0·08
Bovey Tracey	2·6	1·3	0·75
Braunton	0·21	0·16	0·11
Bridgwater	0·21	0·14	0·09
Bridport	0·75	0·45	0·24
Brixham	2·0	0·7	0·24
Broad Clyst	1·4	0·9	0·6
Budleigh Salterton	1·0	0·55	0·29
Callington	10	7·0	4·5
Camborne	0·26	0·18	0·1
Camelford	0·55	0·16	0·1
Cannington	0·2	0·14	0·1
Castle Cary	0·45	0·18	0·1
Chacewater	0·4	0·22	0·16
Chard	0·3	0·13	0·07
Charlestown	1·8	1·0	0·5
Charminster	0·35	0·22	0·15
Cheddar	0·22	0·15	0·1
Chudleigh	5·5	3·2	2·0
Constantine	1·3	0·9	0·6
Crediton	2·0	0·55	0·27
Cullompton	0·55	0·4	0·27
Curry Rivel	0·26	0·14	0·11
Dartmouth	4·2	0·47	0·15
Dawlish	0·7	0·45	0·26
Dorchester	0·21	0·1	0·05
Dulverton	0·55	0·13	0·06
Ermington	1·3	0·55	0·26

Town	Field strength exceeded at stated percentage locations		
	10%	50%	90%
Evercreech	0·17	0·13	0·1
Exeter	1·3	0·8	0·2
Exminster	0·6	0·4	0·24
Exmouth	3·0	1·8	1·0
Falmouth	1·0	0·45	0·22
Fowey	2·5	1·4	0·75
Glastonbury	0·3	0·17	0·12
Great Torrington	0·75	0·35	0·2
Halberton	1·0	0·6	0·45
Hatherleigh	1·3	0·55	0·45
Hayle	0·14	0·08	0·045
Helston	0·25	0·07	0·03
Holsworthy	2·1	1·3	0·6
Honiton	2·0	1·4	0·7
Ilminster	0·45	0·18	0·11
Ivybridge	0·7	0·4	0·24
Kenton	1·3	0·55	0·4
Kingsbridge	1·4	0·55	0·4
Kingsteignton	6·0	4·0	1·7
Lanivet	0·6	0·32	0·13
Launceston	4·5	1·1	0·5
Liskeard	9·0	3·2	1·6
Looe	7·0	1·1	0·21
Lostwithiel	3·0	0·35	0·25
Ludgvan	0·8	0·45	0·14
Lyme Regis	0·4	0·05	0·03
Lytchett Minster	0·13	0·11	0·1
Marazion	0·1	0·08	0·06
Martock	0·16	0·11	0·08
Menheniot	4·5	3·5	2·2
Milverton	0·32	0·2	0·13
Modbury	7·0	2·2	1·1
Moretonhampstead	3·5	1·8	1·3
Mullion	0·35	0·22	0·16

Town	Field strength exceeded at stated percentage locations		
	10%	50%	90%
Newlyn	0·55	0·4	0·22
Newquay	0·6	0·35	0·2
Newton Abbot	3·7	2·1	1·0
Northam	0·3	0·18	0·1
North Petherton	0·14	0·1	0·07
Norton Fitzwarren	0·5	0·35	0·3
Okehampton	0·09	0·05	0·03
Ottery St. Mary	1·6	0·9	0·5
Padstow	1·0	0·6	0·25
Paignton	4·5	1·1	0·45
Penryn	0·9	0·22	0·06
Penzance	0·3	0·14	0·08
Plymouth	20	7·0	2·1
Redruth	0·4	0·11	0·05
St. Agnes	1·0	0·5	0·18
St. Austell	4·0	1·4	0·35
St. Blazey	4·0	0·9	0·45
St. Buryan	0·32	0·3	0 22
St. Columb Major	1·3	0·55	0·4
St. Germans	10	6·0	4·0
St. Ives	0·85	0·4	0·13
St. Just	0·18	0·11	0·06
Salcombe	5·0	1·0	0·25
Saltash	80	25	8·0
Seaton	0·5	0·1	0·06
Shepton Mallet	0·2	0·11	0·06
Sherborne	0·14	0·09	0·05

Town	Field strength exceeded at stated percentage locations		
	10%	50%	90%
Sidbury	0·6	0·45	0·28
Sidmouth	0·75	0·4	0·22
Somerton	0·2	0·14	0·11
Stithians	2·2	1·1	0·9
Stoke sub Hamdon	0·24	0·13	0·07
Street	0·15	0·1	0·07
Taunton	0·4	0·28	0·2
Tavistock	100	32	10
Teignmouth	3·2	1·4	0·5
Tintagel	0·25	0·14	0·12
Tiverton	0·7	0·4	0·24
Topsham	1·7	1·0	0·7
Torpoint	37	20	12
Torquay	11	3·7	1·0
Totnes	4·5	2·2	1·0
Truro	0·7	0·25	0·11
Uffculme	2·2	1·0	0·7
Wadebridge	0·18	0·1	0·05
Wareham	0·14	0·06	0·04
Wellington	0·4	0·25	0·2
Wells	0·25	0·16	0·09
Weston-super-Mare	0·4	0·13	0·04
Weymouth	0·24	0·16	0·1
Wimborne Minster	0·11	0·05	0·03
Wincanton	0·28	0·09	0·06
Woodbury	2·4	1·8	1·3
Yealmpton	4·0	1·8	1·3
Yeovil	0·26	0·11	0·06

APPENDIX II

Sea-scatter Interference

Sea-scatter is experienced at a location where the receiving aerial is screened from the direct transmission by cliffs, local hills or buildings, yet has a clear view of an area of the sea which is irradiated by a relatively strong signal from the transmitter. In these circumstances the direct signal is attenuated and a relatively strong signal is received from the sea by "back-scatter". Owing to the motion of the waves this reflected signal becomes alternately in and out of phase with the direct signal. It has been found that the severity of the interference depends upon the degree of shadowing and upon the area of the sea, as viewed from the receiving aerial, which is irradiated by the direct signal. The condition of the sea and, therefore, the wind velocity also play a large part in determining the level of interference.

Fortunately most viewers in affected areas are not without means of reducing the worst effects of this kind of interference. Their receivers should incorporate a fly-wheel time-base, with an automatic-gain control system capable of maintaining as nearly constant as possible the amplitude of the signal output. Most important of all, the aerial should be directional, its horizontal radiation pattern being suited to the particular situation. It is by no means always a remedy to increase the height of the aerial. The increase in the amplitude of the normal signal when the aerial is raised may be very much less than the increase in interference. It is, however, an advantage to site the aerial where it is shielded from the sea, say by a neighbouring house, taking care not to obstruct the path towards the transmitter.

Attention to these points can make reception tolerable in areas where otherwise it would be quite unusable.

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