COMMUNICATIONS AERIALS

Marconi special purposes aerials have been developed in parallel with the extensive range of equipments which can now be offered, covering the frequency range 40kHz–8000MHz. These aerials can be supplied as complete systems with masts, towers, reflectors and all the necessary supporting structures.

The range of aerials in this section covers the majority of h.f applications, but modified or special systems may be supplied to meet unusual requirements.

Typical h.f aerial types and their applications are described below:

Dipole: An economical solution to the requirements of short to medium links on spot-frequency operation. Various arrangements include coaxial fed, cage and folded dipoles. Reflectors supplied where required.

Quadrant: Spot frequency omnidirectional aerial suitable for medium distance communications links as well as broadcast coverage e.g meterological, press and ship-to-shore services.

Rhombic: High gain and directivity are the two qualities of this array; a useful aerial for medium or long distance circuits.

Long-Periodic: This design avoids the necessity for individual aerials working at each required frequency. Suitable for short/medium/long distance point-to-point links including broadcast sector coverage.

Tropospheric scatter aerials: These may vary in size from 10ft to 120ft all depending upon path characteristics and reliability required.

Feeder runs and matching transformers are supplied according to requirements. Aerial erection teams are on call to erect and maintain aerials at short notice in any part of the world.

Survey work can be undertaken by specialists to establish the optimum position and orientation of directional systems and assistance can always be given with the design of mast and tower foundations as dictated by the circumstances of the site.

Log Periodic Aerials

	H1700	H1701	H1702	H1703	H1704	H1705	H1706	H1707	H1708
Frequency range (MHz)	2–24	2·8–28	4–28	4–28	6–28	6–28	4–28	2–24	4–28
Function (transmit or receive)	T/R	R	T/R	T/R	T/R	T/R	T/R	R	R
Polarization	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Horiz.	Vert.	Horiz.	Elliptic.
Directive gain (dB relative to isotropic above perfect ground)	12	14	14	15	15	15	12	12	12
Angle of fire (nominal)	45°	20°	20°	15°	17°	10°	0°	60°	0°
Angle of half-power points (elevation)	22° & 64°	11° & 36°	11° & 36°	8° & 26°	10° & 35°	5° & 16°	16°	37° & 79°	40°
Beamwidth between half-power points (azimuth)	63°	58°	58°	47°	44°	45°	90°	63°	62°
Mast height in metres (ft)	61 (200)	76 (250)	50 (165)	67 (220)	33 (110)	76 (250)	48 (150)	43 (140)	40 (130)
Distance between masts in metres (ft)	91 (300)	108 (355)	76 (250)	101 (330)	70 (230)	71 (232)	— —	61 (200)	* *
Overall length of curtain (projected to ground) in metres (ft)	84 (276)	167 (544)	116 (380)	171 (560)	126 (414)	137 (450)	70 (230)	95 (311)	78 (256)
Headloading (100 m.p.h wind—no ice) in kg (lbs)	810 (1800)	1170 (2600)	1080 (2400)	1170 (2600)	1170 (2600)	1170 (2600)	855 (1900)	810 (1800)	1800 (4000)
Input power (kW p.e.p)	10	40	40	40	40	40	40	40	40

*One mast only required but distance between ground anchor line of each curtain is 79m (260ft)

The basic electrical design of these aerials confers several valuable advantages. A large part of the h.f band may be covered using only one aerial, while the shape of the beam and input impedance remains substantially the same over a wide bandwidth.

General

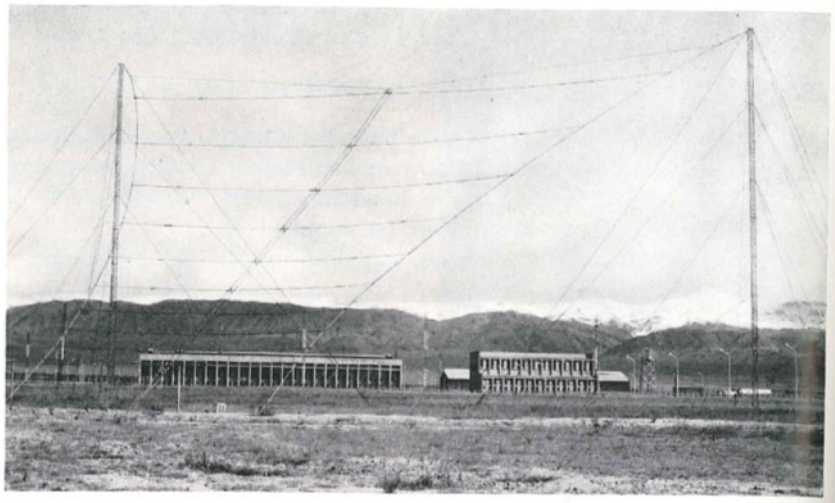
The log-periodic aerial is an end-fire array with a beam width of approximately 60° between 3dB points. Its main characteristic is that the shape of the beam remains constant over a very wide frequency range and the input impedance is also substantially constant over the same range. It is therefore applicable to h.f circuits where a large bandwidth is required.

In h.f propagation using the ionosphere short- and medium-length routes, radiation at a given angle above the horizon is required, this angle depends on the route length and the predominant ionospheric layer used. To obtain the required radiation pattern in the presence of the ground, the low-frequency end of the aerial is supported at a height which gives the appropriate angle of fire and the projected apex of the aerial is placed at ground level. The radiation centre, which varies with frequency, is then at a constant height in wavelengths above ground and the angle of its fire therefore constant.

Whilst log-periodic aerials can readily be made to give free-space gains of the order of 11dB with respect to an isotropic source, the full increase of 6dB which is normally obtained when an aerial is placed above ground cannot be realized. This is because, to obtain the required radiation pattern, the aerial must be mounted with its axis sloping into the ground so that the radiation at the angle of fire comes from the top side of the primary beam. The presence of ground then increases the gain by about 4dB, giving a total gain of approximately 15dB with respect to an isotropic source.

It is evident that the angle which the aerial axis makes with the ground should be kept as small as possible so that, for a given mast height, the aerial should be fairly long. Furthermore, because the useful radiation comes from the top side of the primary lobe, the primary gain (i.e. the gain in free space) should not be too high as this would result in a primary lobe which is too narrow.

These remarks apply to horizontally polarized aerials, which are generally preferred because a ground screen is not required. Where a low take-off angle is essential for the longer circuits then the vertically polarized log-periodic aerial provides an economic solution. The curtain of the vertically polarized long-period aerial can be supported from one mast and a minimum of site area is required.



Horizontally polarized log periodic aerials at Khamalabad, Tehran

For polarization diversity reception a special arrangement (Type H1709) is available. In this configuration two log-periodic aerial curtains are supported from one mast and each inclined at 45° to the ground.

The Marconi range of log-periodic aerials are designed to give a good impedance characteristic and 2 to 1 v.s.w.r. The input impedance is of the order of 375Ω and a taper line kit is available to transform to standard 600Ω twin-wire transmission line.

Alternatively, for receiving applications, a suitable matching transformer such as the Type H2405 can be used for conversion to an impedance of 75 or 50Ω for coaxial connection.

Construction

All parts are pre-fabricated for simple and rapid erection on site.

Full use is made of stainless steel, polypropylene and other modern materials. The 2in. side rope catenaries are pre-stretched plaited terylene (breaking strain 8000lb) and the stranded copper wire dipole elements are attached to the side ropes using polythene rope make-up assemblies.

Standard lattice or tubular steel masts can be employed.