Marconi Log-periodic Aerials

	H 1700	H 1701	H 1702	H 1703	H 1704	H 1705	H 1706	H 1707	H 1708
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 (ft)	200	250	165	220	110	250	150	140	130
Distance between masts (ft)	300	355	250	330	230	232	—	300	*
Overall length of curtain (projected to ground) (ft)	276	544	380	560	414	450	230	311	256
Headloading (100 m.p.h wind–no ice) (lb)	1800	2600	2400	2600	2600	2600	1900	1800	4000

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

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.

In the case of aerials in the upper part of the frequency range where a wide frequency range is not required, a reduction in mast height and site area may be achieved. The Data Table shows the standard designs produced and their functional characteristics. The same basic curtain may be used for transmitting and receiving applications, except for the H 1701, 1707 and 1708, which are for receiving only.

General

The log-periodic aerial is an end fire array with a beam width of approximately 60° between 3 dB 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 for 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 high 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 therefore at ground level. The radiation centre, which varies with frequency, is then at a constant height in wavelengths above ground and the angle of is fire therefore constant.

Whilst log-periodic aerials can readily be made to give free-space gains of the order of 11 dB with respect to an isotropic source, the full increase of 6 dB 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 4 dB, giving a total gain of approximately 15 dB 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 log-period aerial can be supported from one mast and a minimum of site area is required.

For polarization diversity reception a special arrangement (Type H 1708) is available. In this configuration two log-periodic aerial curtains are supported from one mast and each incined at 45° to the ground. This principle is derived from two sets of dipoles at right angles to each other—an arrangement which was pioneered by The Marconi Company several years ago in the form of either a Maltese or St Andrew's cross. Either curtain can be erected or lowered independently of the other.

The Marconi range of log-periodic aerials are designed to give a good impedance characteristic and 2 to 1 V. S.W.V. The input impedance is of the order of 375 ohms and a taper line kit is available to transform to standard 600 ohm twin-wire transmission line.

Alternatively, for receiving applications, a suitable matching transformer such as the Type H 2405 can be used for conversion to an impedance of 75 or 50 ohms for coaxial connection.

With the exception of the Type H 1700 all the standard transmitting log periodic designs are capable of input powers up to 25 kW (mean) or 40 kW p.e.p. The Type H 1700 is rated at 10 kW p.e.p.

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 2 in side rope catenaries are pre-stretched plaited terylene (breaking strain 8000 lb.) 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.

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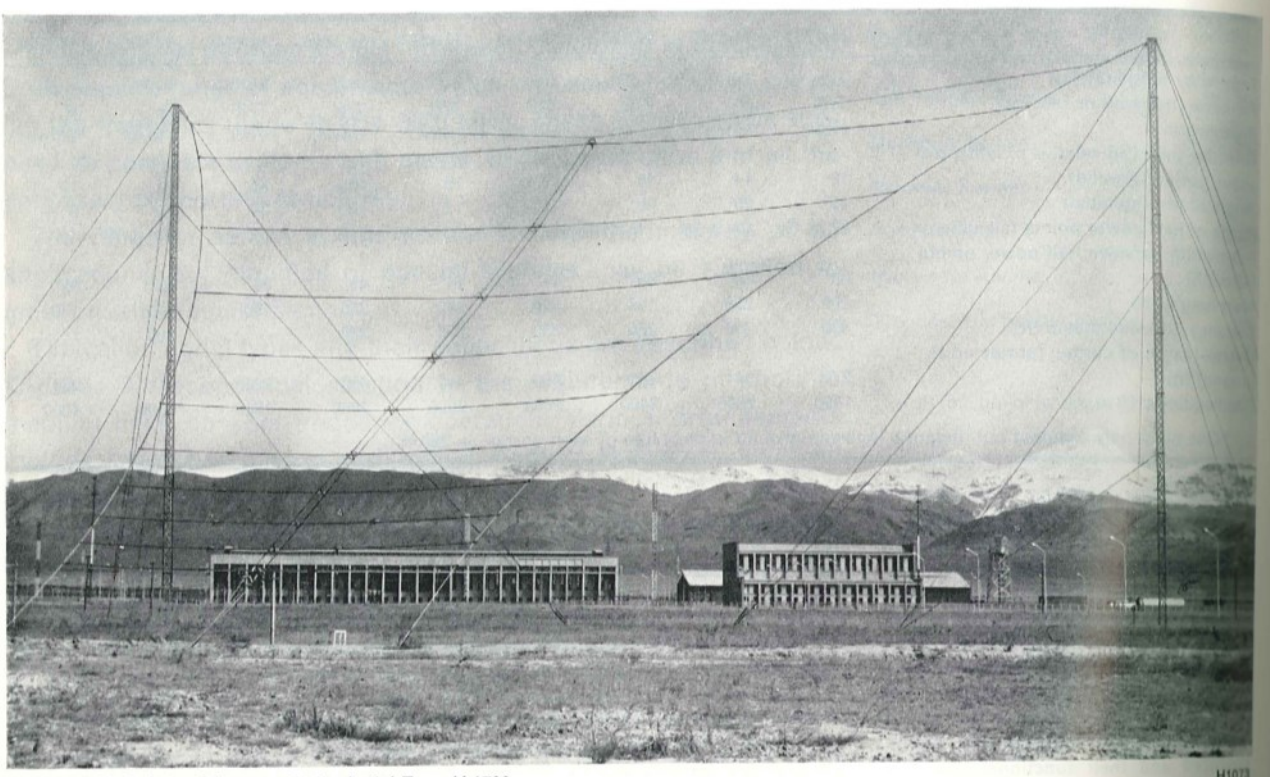
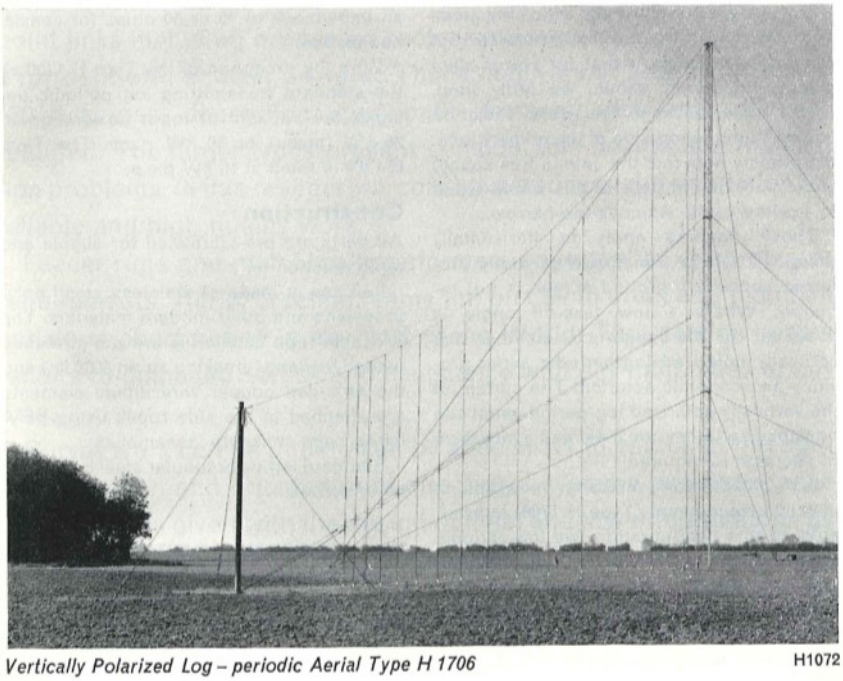


Horizontally Polarized Log – periodic Aerial Type H 1700 H1073



Vertically Polarized Log – periodic Aerial Type H 1706 H1072

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