COAX AND FEED SYSTEMS

Feed Systems - The Simpler, The Better...

Despite popular belief, linear radiators, normally employed in 2 and 3 element parasitic arrays, have a driving point impedance of close to 52 ohms when open at the center. To feed such a radiator it is only necessary to connect a 52 ohm line at this point to achieve the best possible match of line to antenna.

However, because of certain design characteristics, some beam antennas require elaborate and, sometime, unstable matching devices such as Gamma or T-Match systems or variations of these systems. Such devices are usually difficult to adjust and to maintain in adjustment when used in multi-band beams.

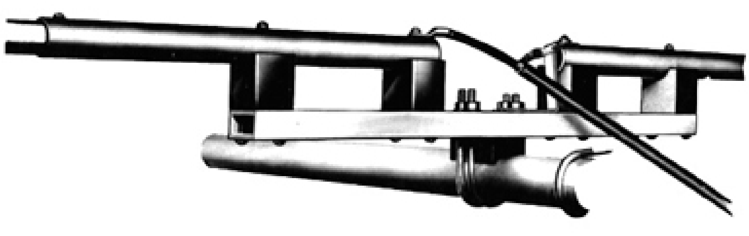
MOSLEY TRAP MASTER beams, however, are so designed as to not require any unwieldy matching arrangements. Mosley beams are fed by connecting the line directly to the open center of the radiator. Thus, an excellent match is achieved over the entire width of each Ham band resulting in extremely low SWR near resonant frequencies of each band and the ability to range from one end of the band to the other without excessive SWR.

By eliminating such matching devices, MOSLEY TRAP MASTER beams provide their users with stable and dependable operation without the necessity of frequent trips to the roof or up the tower to make readjustment.

MOSLEY TRAP MASTER AND POWER MASTER SERIES...

A Discussion of Beam Antenna Feed Systems

Among those Hams interested in beam antennas, many are concerned with the feed systems employed. It is for these Hams that we shall attempt to explain the wonderfully simple - yet highly efficient - feed system used in both the *Trap Master* and the *Power Master* series of Mosley beam antennas.



The beliefs that a balanced radiator element cannot be fed with an unbalanced line and that the impedance at the center of the element is not of suitable value to permit direct connection of a 52 ohm coax line are not always correct. We will show, with authoritative references, that antennas *can* be designed to take advantage of the simplicity of such a system and still provide low VSWR over a broad bandwidth and a symmetrical radiation pattern. Page numbers will refer to the ARRL Antenna Book, seventh edition.

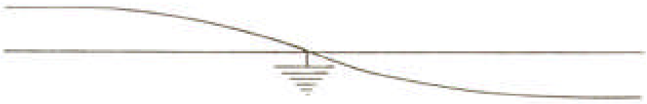


Fig. A

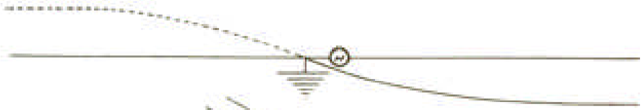


Fig. B

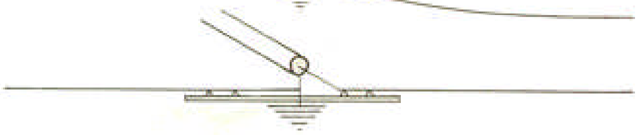


Fig. C

The voltage distribution over a half-wave radiator is shown in *Fig. A*. Since voltage is zero at the center, a ground may be placed at this point. (*Page 26*)

There are a variety of methods for introducing energy into the antenna. A balanced line may be connected directly to suitable points at each side of the grounded element center - a method commonly called the *delta* match or, with slight modification, *T* match. To connect an unbalanced line to a grounded un-split element, the *gamma* match from grounded center to a suitable point at one side of center may be used.

However, the element may be split at the center and fed with either a balanced line without a ground at the center or an unbalanced line with or without a ground at the center. With an unbalanced line and ground on *both* the outer conductor (coax braid) and antenna center, a voltage introduced just off center in the position of the power source (*Fig. B*.) will introduce a voltage in this excited side, as shown. With the other half of the antenna element an integral part of the circuit, voltage will appear as indicated by the dotted line. Since the end of the feed line is fundamentally the same as a power source it may be replaced in the circuit, (*Fig. C*.), resulting in a balanced antenna fed with an unbalanced line. The ground at the center helps to minimize stray feed line currents to achieve the balance pattern. (*Pages 98-100*) (*See, also, page 224, Fig. 10-10*).

Curves on *page 169, Fig. 4-51*, show how a three element beam, by correct tuning and element spacing, may present a feed point impedance of from 10 to 70 ohms. Of course, MOSLEY beams are tuned and spaced to present 52 ohms at suitable tuning points with low VSWR over the entire bands of operation and to achieve proper voltage distribution for a balanced radiation pattern.

THE CLASSIC FEED SYSTEM... *By W.E. "Barney" St. Vrain, W0PXE*

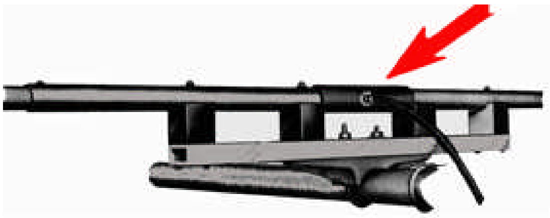
Since the introduction of multi-frequency beams, the method of feeding such antennas has been a subject of much disagreement. When the Mosley *Trap Master* and *Power Master* beams were introduced, Mosley Electronics ran a series of advertisements in the technical magazines explaining the method employed. Since that time we have tried a wide variety of feed systems endeavoring to improve on the original system.

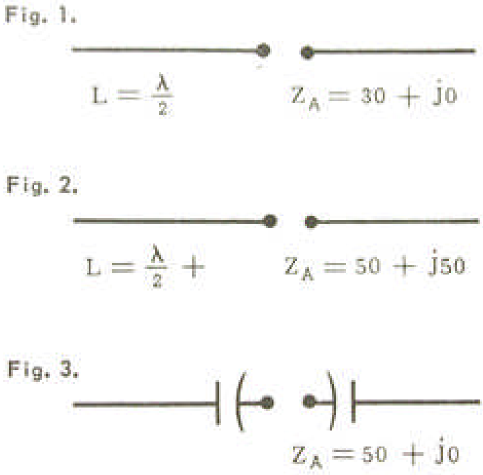
Testing Other Feed Systems

In testing, we found a three-band gamma system ineffective without isolation networks which resulted in a feed system cost about equal to the antenna cost; with a system using hairpins, the cost proved low but the system did not provide a better match that the original Mosley matching system. It became quite clear to us that the Mosley system was hard to beat, for we had found only one slight disadvantage: the elements needed to be stagger tuned to raise the feed point resistance from about 30 to 50 ohms. This slight detuning, which proved advantageous in increasing bandwidth, brought about, in turn, a slight gain loss of about 0.5 to 1.0 db. at resonance.

The Classic System

In order to give hams a new choice in beam matching systems and an antenna featuring maximum gain with increased bandwidth, we devised the matching method used on our Classic antennas **-** Balanced Capacitive Matching (Patented) **-** a method which takes advantage of the principle that antenna resistance at the center driving point increases s the antenna length increases. Figure No. 1 shows the radiator element of a three-element beam at resonance having an impedance at the driving point (Z_A) of about 30 + J0 ohms. If the element is made longer, Z_A can be raised to about 50 +J50 ohms (Figure No. 2). Since the reactance is inductive, it can be cancelled with a series capacitor of 50 ohms reactance, leaving 50 ohms feed point resistance (Figure No. 3). Series capacitors used on the Classic antennas are made by inserting a suitable length of heavily insulated wire into each half of the element tube at the center. The wires are terminated in a plastic tube enclosure with a type 'N' or type 'SO-239' connector for connection of the coaxial cable. To isolate the outer coax conductor from ground, the coax line is coiled for a few turns near the antenna end. This is designed to prevent the very unlikely effect of "Feed Line Radiation."





Conversion to Other Bands

Classic beams are not designed for 40-meter or other conversion. (Except the CL-33-M WARC). The Classic Feed System has a fixed capacity which is not easily changed. This capacity is not high enough for the antenna to operate on 40 meters without making the element excessively long. The engineers at Mosley designed the Classic Feed to give the ham increased bandwidth and extra gain on all bands. It is our conviction that discriminating DX'ers will find the Classic Beams specifically suited to their needs. (NOTE: The CL-33-M can be modified to add 12/17, then 40-meters is possible. The Classic Feed System is replaced with the Mosley Matching System).