HERTZ ANTENNA

(“Dipole”, “Doublet”, “Half-wave” or “Ungrounded”)

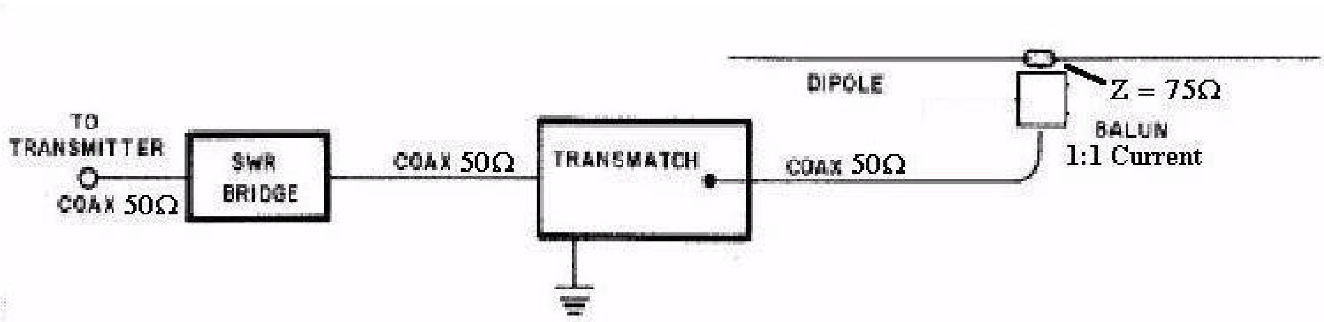


Fig-1 – Common Center Fed Monoband Hertz used with coaxial cable

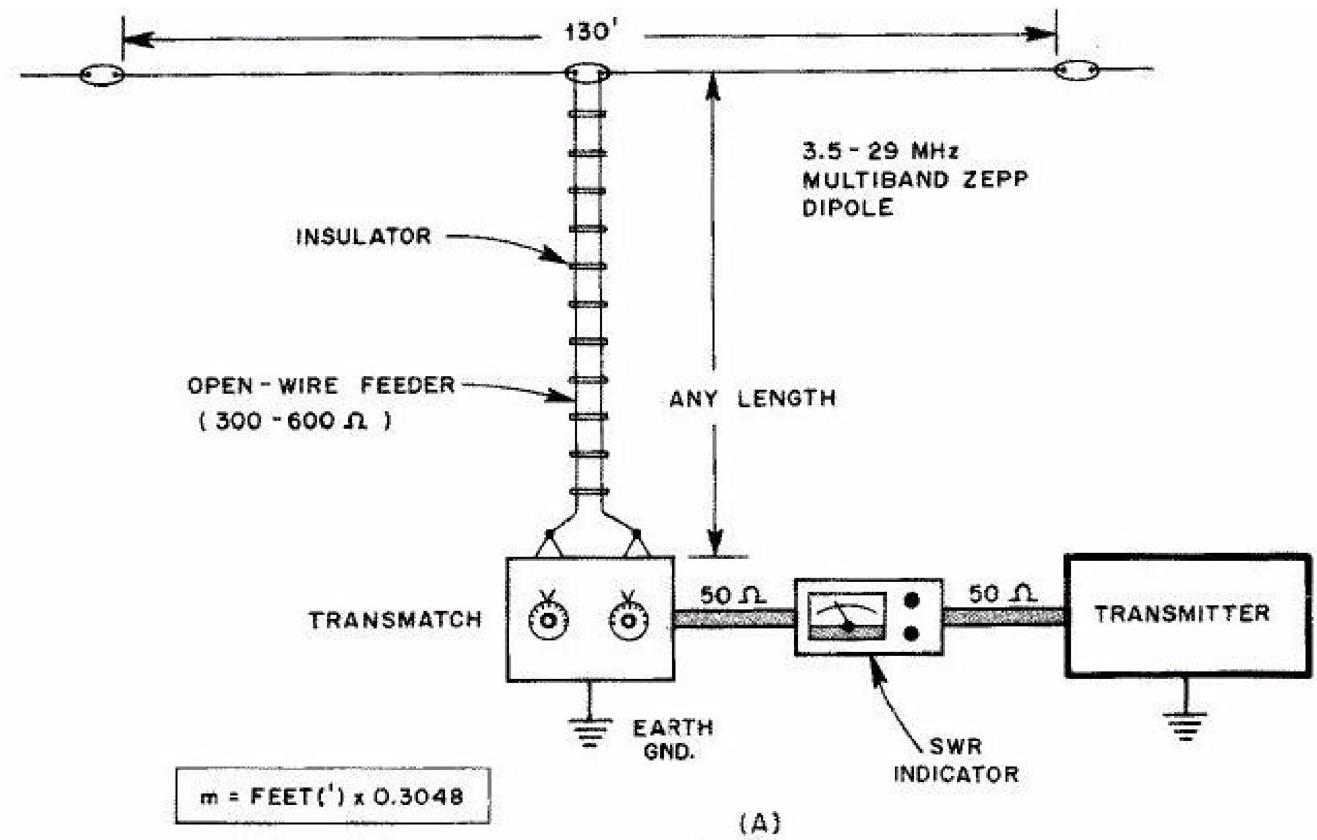


Fig. 2 — Example of a center-fed Zepp antenna for multiband use with open-wire feeders.

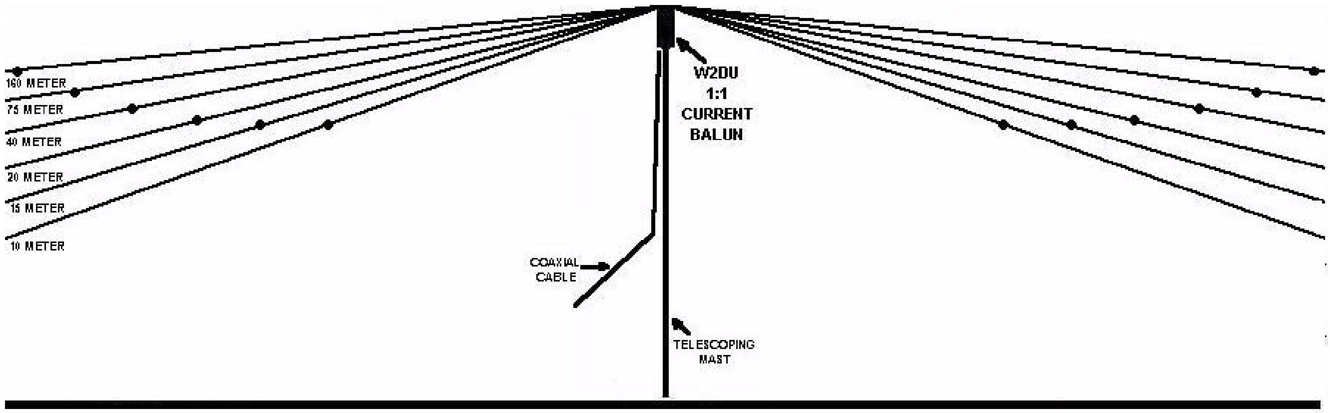
When Radio Frequency Alternating Current (RFAC) energizes an antenna from a transmitter, current and voltage variations occur along the length of the antenna, which produce an ElectroMagnetic (EM) field that is radiated by the antenna. Since the strength of the radiated EM field depends on the amplitude of the antenna voltage and current, a large amount of RFAC must be supplied by the transmitter. Basically, the relationship requires that the RFAC be such that the antenna appears to the transmitter as a ***resonant circuit***. For this to occur, the antennas physical length must be some multiple of the electrical wavelength of the applied RFAC. Most commonly, this multiple is one-half wavelength ($1/2\lambda$), in other words, an antenna whose physical length is equal to one-half the electrical wavelength of the applied RFAC. Such an antenna is called a ***half-wave antenna.***

There are a variety of antennas in use today, which range in complexity from a simple, single conductor to elaborate arrays containing many elements. **For any particular application, the type of antenna used depends on the requirements of the system, which include the "Frequency", "Directivity", "Polarization" and "Range".** **One of the simplest, yet widely used antennas invented early in 1886**, is the ***"Hertz".*** It is named after its **inventor**, ***German Physicist Dr. Heinrich Rudolph Hertz***. **Essentially, a Hertz is any antenna that is one-half wavelength long, or any 'even' or 'odd' multiple of a half wavelength long. The "Basic" Hertz is a single wire antenna, center fed with a total physical wire length equal to one half of the electrical wavelength of the RFAC to be transmitted. The Hertz antenna, is also know as a *"Dipole", "Doublet", "Half-wave" or "Ungrounded"* antenna. It can be mounted in a vertical, horizontal, or slanting (sloping) position**. The **center** of a half-wave antenna is a **low impedance** ("high" current / "low" voltage) point of approximately **73**Ω. The **end** of a half-wave antenna is a **high impedance** ("low" current / "high" voltage) point of approximately **2400**Ω. (**Figure-1)**

The operation of the Hertz antenna is based on the fact that the wavelength to which 'any wire' will tune depends directly upon its length. The radiator is thus self-tuned and no ground or other conducting plane is necessary. A Hertz antenna is erected some distance above ground and consequently, can be placed where it is less disturbed by the effects of grounded objects, such as buildings and shrubbery. Since the Hertz is usually one-half wavelength long, they are rather long at Low Frequencies (LF) and Medium Frequencies (MF). **Example; a Hertz antenna for a frequency of 1.8 MHz would be 260 feet long**.

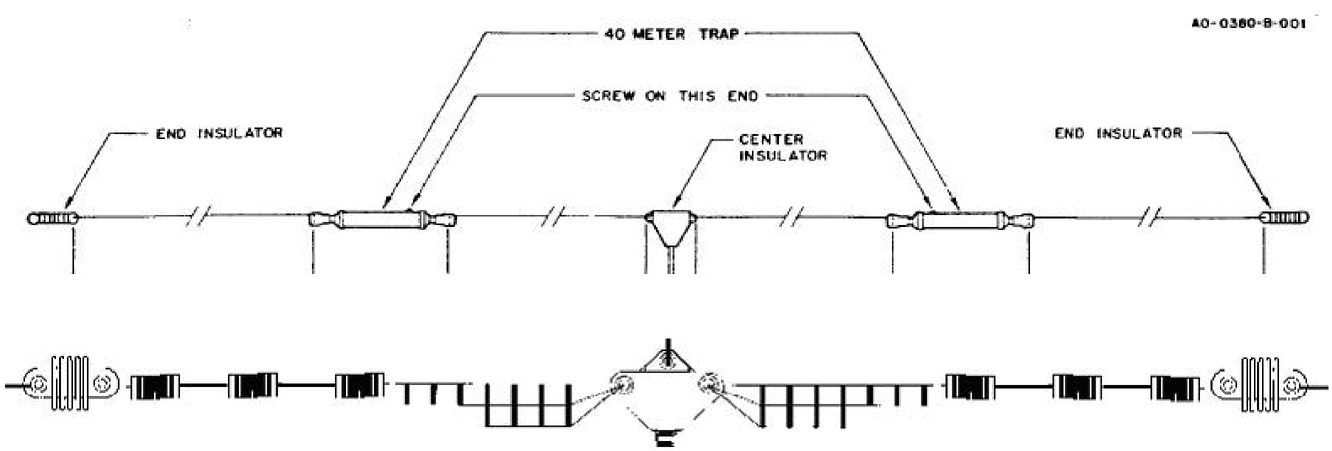
Multi-band Hertz

1. **The 1st way to build a multi-band Hertz is, theoretically a 260 foot long Hertz (130 feet on each leg) is a multi-band antenna capable of being used with moderate efficiency on frequencies from 160 Meters to 2 Meters, by using a quality tuner (impedance matching network).**
2. **The 2nd way to build a multi-band Hertz is to parallel connect the centers of several together and feed them with a common RF feed line. This antenna system can work on several bands using a minimum of space. In this version of the Hertz, each insulated end can be tied to any convenient support and the antennas need not all be in the same plane. (Figure-2)**



(Figure-2) 10 – Multiple Mono Band Hertz Center Fed Parallel Connected (Sometimes called a "Fan" Dipole)

3. The 3rd way to build a multi-band Hertz when space is limited is to use traps, consisting of parallel tuned circuits inserted in the two segments. To build an antenna suited for the 40 and 20 Meter bands, insert a trap on each segment. The full length of each segment is resonant on the 40 Meter band while the length going from the center feed point to the first trap is resonant on the 20 Meter band. Traps should be designed to resonate at 14 MHz (20 Meters), isolating the end sections of the dipole from the feed line at that frequency. On 7 MHz (40 Meters), the traps would have low impedance, and the whole antenna is used. Some trimming of the segments is however necessary compared to the calculated lengths to compensate for the effects of the traps. (Figure-3)



(Figure-3) Trap center fed versions of Multi-band Hertz

4. The 4th way to build a multi-band Hertz is using the properties of electromagnetism; a dipole cut to be resonant at a certain frequency will also be resonant on its 3rd harmonic. For example at three half-waves higher, eliminating the need for an additional antenna. If a dipole is designed for the 40 Meter (7 MHz) band it will be also be resonant on the 15 Meter band (21 MHz). This is the way the antenna system called a "G5RV", (named after its' inventor Louis Varney

"G5RV") multi-band Hertz works as well as all harmonic antennas.

If a Hertz is primarily going to be used for local communications, heights of 1/3l above ground and below become omnidirectional with less than 1 dB of attenuation in the end fire direction (for 1/5l and below), which suggests that a height between 0.3l - 0.4l is the best choice. The feedpoint impedance will decrease if you install the antenna wire at very low heights.

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