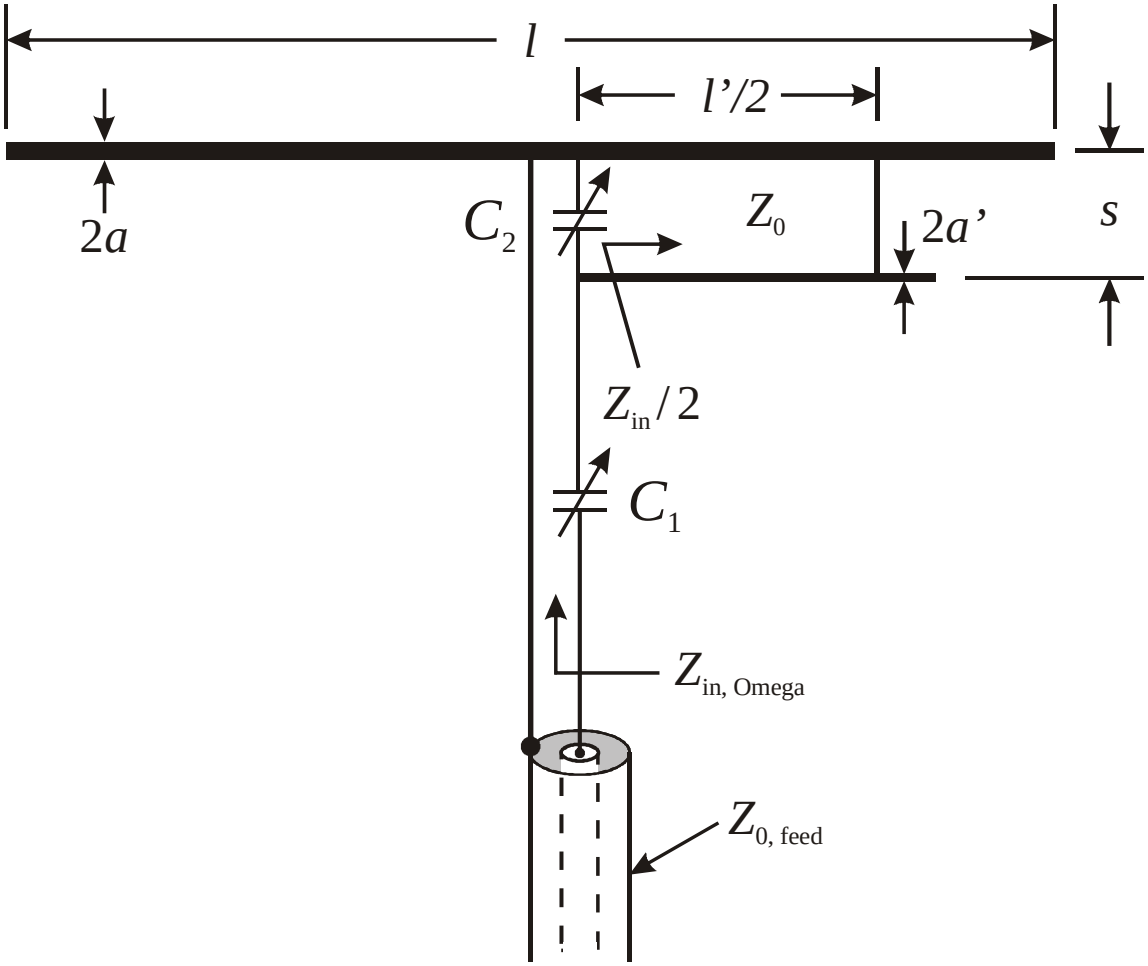
Matching Techniques for Driving Yagi-Uda Antennas: Omega-Match

(Sections 9.5 & 9.8 of Balanis)

Omega-Match:



- The Omega-Match is a variation on the Gamma-Match that also allows the driven element of Yagi-Uda antennas to be fed by coaxial transmission lines (unbalanced).

- Note that an additional capacitor C_2 has been placed in parallel to the transmission line component of the Gamma-Match. This allows for an additional degree of freedom in trying to match the driven element of the Yagi-Uda antenna to the transmission line.

- The process for finding the input impedance is similar to that of the Gamma-Match. In fact, we can simply modify the expression for the input impedance of the Gamma-Match by replacing C with C_1 and Z_{cap} with Z_{C1}. In addition, the second term in the Gamma-Match input impedance equation $Z_{\text{in}}/2$ is placed in parallel with the impedance of C_2 yielding

$$Z_{\text{in,Omega}} = Z_{C1} + Z_{C2} \left\| \left(\frac{Z_{\text{in}}}{2} \right) \right.$$

$$= Z_{C1} + \frac{Z_{C2}\left[\dfrac{(1+\alpha)^2 Z_a Z_t}{(1+\alpha)^2 Z_a + 2Z_t} \right]}{Z_{C2} + \dfrac{(1+\alpha)^2 Z_a Z_t}{(1+\alpha)^2 Z_a + 2Z_t}}$$

where Z_{in} is the input impedance for a T-Match of length l', $Z_{C1} = \dfrac{1}{j\omega C_1}$, $Z_{C2} = \dfrac{1}{j\omega C_2}$, Z_a is the input impedance of the antenna mode of the driven element, α is the current divisor factor, and Z_t is the input impedance of the transmission line mode of the Omega-Match. The parameters Z_a, α, and Z_t are calculated in the same manner as for the Gamma-Match or modified Gamma-Match.