Finite Length Dipole

\[ I_e = \bar{a}_3 \Gamma_0 \sin \left[ k \left( \frac{\ell}{2} - \bar{z} \right) \right] \quad 0 \leq \bar{z} \leq \ell/2 \]

\[ = \bar{a}_3 \Gamma_0 \sin \left[ k \left( \ell/2 + \bar{z} \right) \right] \quad -\ell/2 \leq \bar{z} \leq 0 \]

... Why?

Neglect radiation

\[ \Pi_3 = -1 \quad \Pi_3 = -1 \]

I=0 \quad TEM mode wave \quad I=0

Natural modes of this system are
Transmission Line Analog

$I = 0$ at end

$\frac{\lambda}{2}$

Standing waves

Unfolding the Transmission Line

Short Distance

less than $\frac{\lambda}{4}$ unfolding
\( \frac{\lambda}{2} \) unfolding

\( \frac{\lambda}{4} \)

ONE HALF WAVE LENGTH

Dipole

I was a loop everywhere in phase on the dipole

\( \frac{\lambda}{2} \)

\[ \text{I has two} \]

\[ \text{loops is in phase} \]
Even longer dipole...

Still sine waves reflected at ends

$\frac{3\lambda}{4}$

$\frac{3\lambda}{4}$

$\frac{3\lambda}{2}$ dipole

Input $Z$?

Retaining Transmission Line Analog

$Z = ? = -j \frac{Z_0}{\cot kd}$

do you should expect some variation in $Z(d)$.