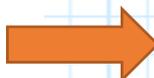


$$\rho_L = \frac{Z_L - Z_0}{Z_L + Z_0}$$

$$Z_{in}(-\ell) = Z_0 \frac{Z_L(1 + e^{-2j\beta\ell}) + Z_0(1 - e^{-2j\beta\ell})}{Z_0(1 + e^{-2j\beta\ell}) + Z_L(1 - e^{-2j\beta\ell})}$$



$$Z_{in} = Z_0 \left( \frac{Z_L \cos \beta\ell + j Z_0 \sin \beta\ell}{Z_0 \cos \beta\ell + j Z_L \sin \beta\ell} \right)$$

$$= Z_0 \left( \frac{Z_L + j Z_0 \tan \beta\ell}{Z_0 + j Z_L \tan \beta\ell} \right)$$

For open circuit :

$$Z_{in}(-\ell) = \frac{v(-\ell)}{i(-\ell)} = -jZ_0 \cot(\beta\ell)$$

For short circuit :

$$Z_{in}(-\ell) = \frac{v(-\ell)}{i(-\ell)} = jZ_0 \tan(\beta\ell)$$

$$Z_0 = \sqrt{\frac{R + j\omega L}{G + j\omega C}}$$

$$\gamma = \sqrt{(R + j\omega L)(G + j\omega C)} = \alpha + j\beta$$

For example :  $R = 100\Omega/m$ ,  $L = 80 \text{ nH/m}$ ,  $G = 1.6 \text{ S/m}$ , and  $C = 200 \text{ pF/m}$ .

**My questions:**

Suppose I have a cable with length  $L_0$ .

- (1) How can be find equation of  $Z_{in}$  that with length  $N$  times of  $L_0$ .
- (2) Equation of  $Z_{in}$  that with length of  $L_0/N$ . (relation between  $Z_{in}$  with  $L_0$  and  $Z_{in}$  with  $L_0/N$ )
- (3) If from (2) define different RLGC for  $N$  parts of cable ( $1/N$  length of cable with variable RLGC), how can be obtain  $Z_{in}$  in total length  $L$ . (it seems not adding together, but may be we can first divide  $Z_{in}$  to  $N$  parts)