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

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

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

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

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 = 100Ω/m, L = 80 nH/m, G = 1.6 S/m, and C = 200 pF/m.

My questions:

Suppose I have a cable with length Lo.

(1) How can be find equation of Zin that with length N times of L0.

(2) Equation of Zin that with length of L0/N. (relation between Zin with L0 and Zin with L/0N)

(3) If from (2) define different RLGC for N parts of cable(1/N length of cable with variable RLGC), how can be obtain Zin in toal length L. (it seems not adding together, but may be we can first divide Zin to N parts)