$$R_0 = R_\delta + R_{\rm ex} + R_{\varepsilon''}$$

R

V_R

V_0

function generator

$\varepsilon' C$

$\varepsilon' C_{\rm eff}(\omega, \sigma)$

$R_{\rm eff}(\omega, \sigma)$

$R_\delta + R_{\rm ex} + R_{\varepsilon''}$

R_σ

$R_{\rm tot}$

R_δ

I

δ

$2\pi r_0$

L

$R_{\rm Al}$

$$C$$

$$r_0$$

$$w$$

$$t$$

$$\ell$$

$$Z_\mathrm{p} = R_\mathrm{p} + \frac{1}{j\omega C_\mathrm{p}}$$

$$C_\mathrm{f}$$

$$\left(\varepsilon_\mathrm{r} - j\frac{\sigma_\mathrm{dc}}{\omega\varepsilon_0}\right) C_0$$

I think I'm in love with.

$$\boldsymbol{E}(\boldsymbol{z},t) = E_0 e^{i(\omega t - kz)}\hat{x}$$
$$\boldsymbol{H}(\boldsymbol{z},t) = H_0 e^{i(\omega t - kz)}\hat{y}$$

$$Z_0 \equiv \frac{|\boldsymbol{E}|}{|\boldsymbol{H}|}$$

$$\nabla \times \boldsymbol{E} = -\mu_0 \frac{\partial \boldsymbol{H}}{\partial t}$$

$$Z_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}} \approx 377\ \Omega$$

$$Z_\mathrm{S} = R_\mathrm{S} + iX_\mathrm{S} \equiv \left.\frac{E_x(z,t)}{H_y(z,t)}\right|_{z=0}$$

$$\boldsymbol{E}(\boldsymbol{z},t) = E_0 e^{i\omega t - \kappa z}\hat{x}$$
$$\boldsymbol{H}(\boldsymbol{z},t) = H_0 e^{i\omega t - \kappa z}\hat{y}$$

$$Z_\mathrm{S} = \frac{i\mu_0\omega}{\kappa} = \sqrt{\frac{\mu_0}{\varepsilon_0\varepsilon}} = \sqrt{\frac{i\mu_0\omega}{\sigma}}$$

$$\sigma(\omega) = \sigma_0$$

$$Z_{\mathrm{S}} = R_{\mathrm{S}} + iX_{\mathrm{S}} = \sqrt{\frac{i\mu_0\omega}{\sigma(\omega)}}$$

$$\sqrt{i} = \frac{i+1}{\sqrt{2}}$$

$$\delta = \sqrt{\frac{2}{\mu_0\omega\sigma_0}}$$

$$R_{\mathrm{S}} = \sqrt{\frac{\mu_0\omega}{2\sigma_0}} = \frac{1}{\sigma_0\delta}$$