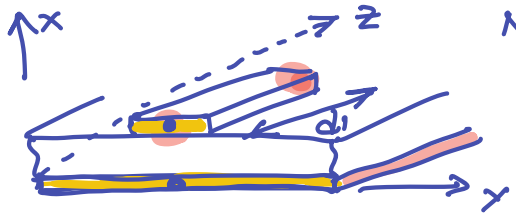
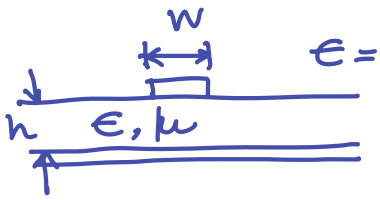
IDEAL TRANSMISSION LINES (LOSSLESS)



MICROSTRIP



$\epsilon = \epsilon_r \epsilon_0$

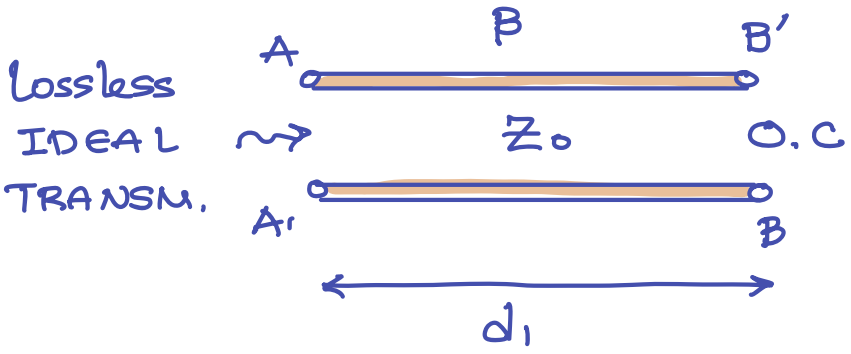
$\mu = \mu_0$

$\epsilon_r = 2.4$

$h = 3\,mm$

$w = 3\,cm$

$f = 1\,GHz$



Z_0 , β

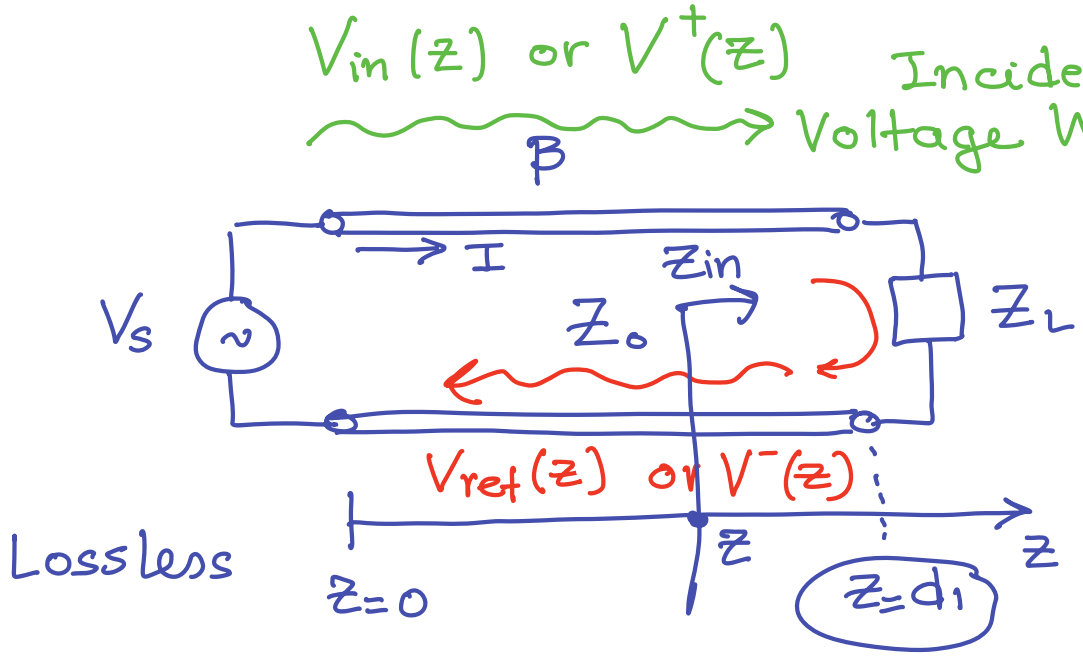
Found it $= Z_0 = ?$ β, λ

MICROSTRIP

$\beta = 2\pi/\lambda$ = phase constant

$= rad/m$

$\lambda =$ (m)



open end

$Z_L = \infty\,(\Omega)$

open-circu

$$V(z) = V_{in}(z) + V_{ref}(z)$$

or

$$= V^{+}(z) + V^{-}(z)$$

$$I(z) = I_{in}(z) + I_{ref}(z)$$

or $$= I^{+}(z) + I^{-}(z)$$

$$V_{in}(z) = V^{+}(z) = V_0^{+} e^{-j\beta z}$$

$$V_{ref}(z) = V^{-}(z) = V_0^{-} e^{j\beta z}$$

$$V(z) = V_0^{+} e^{-j\beta z} + V_0^{-} e^{j\beta z}$$

$$I(z) = I_0^{+} e^{-j\beta z} + I_0^{-} e^{j\beta z}$$

wave equations for Ideal T.L w/o losses

$$\frac{V_0^{+}}{I_0^{+}} = Z_0 \qquad \frac{V_0^{-}}{I_0^{-}} = -Z_0$$

$$V(z) = V_0^{+} e^{-j\beta z} + V_0^{-} e^{j\beta z}$$

$$I(z) = \frac{1}{Z_0}\left[V_0^{+} e^{-j\beta z} - V_0^{-} e^{j\beta z}\right]$$

$$Z_{in}(z) = \frac{V(z)}{I(z)} = Z_0 \left(\frac{V_0^+ e^{-j\beta z} + V_0^- e^{j\beta z}}{V_0^+ e^{-j\beta z} - V_0^- e^{j\beta z}} \right)$$

$$\begin{cases} Z_{in}(z)\Big|_{z=d_1} = Z_L \\ Z_L = Z_0 \dfrac{V_0^+ e^{-j\beta d_1} + V_0^- e^{j\beta d_1}}{V_0^+ e^{-j\beta d_1} - V_0^- e^{j\beta d_1}} \end{cases}$$

$$\boxed{Z_{in}(z) = Z_0 \frac{Z_L + j Z_0 \tan(\beta d_1)}{Z_0 + j Z_L \tan(\beta d_1)}}$$