

## I want to solve transcendental equation in maple and facing problem to plot “β” vs “a” plot, using Eq. 8, 9, 10

$$\varepsilon_M k_0^2 + \gamma_M^2 = \varepsilon_S k_0^2 + \gamma_S^2 = \varepsilon_D k_0^2 - k_D^2 = \varepsilon_C k_0^2 + \gamma_C^2 = \beta^2. \quad (8)$$

The phase constant is obtained by solving the dispersion equation for the hybrid slot waveguide

$$\begin{aligned} & \tan(k_D w - \phi) \\ &= \frac{\varepsilon_D \gamma_S}{\varepsilon_S k_D} \left( \frac{\varepsilon_M \gamma_S + \varepsilon_S \gamma_M - (\varepsilon_M \gamma_S - \varepsilon_S \gamma_M) \exp(-2\gamma_S a)}{\varepsilon_M \gamma_S + \varepsilon_S \gamma_M + (\varepsilon_M \gamma_S - \varepsilon_S \gamma_M) \exp(-2\gamma_S a)} \right) \end{aligned} \quad (9)$$

where  $\Phi$  is defined as

$$\phi = \tan^{-1} \left( \frac{\varepsilon_C k_D}{\varepsilon_D \gamma_C} \right). \quad (10)$$

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**Given:**  $w=220\text{nm}$ ,  $k_0 = \frac{2\pi}{1530 * 10^{-9}}$

$$\varepsilon_S = \varepsilon_C = 1, \varepsilon_D = 11.9, \varepsilon_M = -115.8 + 10.33j.$$