Light reflection and transmission from two emitters

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We consider scattering of light propagating in a waveguide from two identical resonant emitters. Each emitter is characterized by the same amplitude reflection and transmission coefficients

$$r(\omega) = \frac{\mathrm{i}\gamma_{1\mathrm{D}}}{\omega_0 - \omega - \mathrm{i}\gamma_{1\mathrm{D}}} \, , t(\omega) = \frac{\omega_0 - \omega - \mathrm{i}\gamma}{\omega_0 - \omega - \mathrm{i}\gamma_{1\mathrm{D}}} \, . \tag{1}$$

The distance between the emitters is d so that the phase gained by light when travelling between two emitters is $\varphi = \omega d/c$.

Goal 1. Calculate the amplitude reflection coefficient $r_2(\omega)$ of light reflected from both emitters.

Goal 2. Calculate numerically and plot on the same graph three reflection spectra $|r_2(\omega)|^2$ for $\varphi(\omega_0) = \pi/4, \pi/2, \pi$ in the frequency range $(\omega - \omega_0)/\gamma_{1\mathrm{D}} = -5 \ldots 5$. Assume that the frequency dependence of φ in this range can be neglected.