

Eigenmodes for N coupled emitters at $\lambda/2$ distance.

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We consider collective eigenmodes for N emitters coupled to the waveguide and periodically spaced by half wavelength. The eigenmodes are found from the system of equations

$$-i\gamma_{1D} \sum_{n=1}^N e^{i\varphi|m-n|} \psi_n = \omega \psi_m, \quad m = 1, 2 \dots N, \quad (1)$$

where $\varphi = 2\pi d/\lambda$ is the phase gained by light propagating between the two neighboring emitters. We focus on specific case when $d = \lambda/2$, so $\varphi = \pi$.

Goal: Find analytically the eigenfrequencies ω and eigenvectors ψ of Eqs. (1).