

## **Modified Radiation Dynamics in Nanostructured Materials**

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Since photonic crystals have been proposed in 1987, the modification of spontaneous emission has been considered as a feature of fundamental interest.

Here, we use a high-accuracy time-domain simulation of the coupled Maxwell-Bloch equations, to investigate the influence of photonic crystals and/or metallic nano-structures on the decay of initially excited two-level atoms. In particular, we investigate the effects of finite sample sizes as well as the influence of non-radiative transitions and dephasing.

All simulations are performed by a non-linear extension of a matrix-exponential integrator based on Krylov-subspace techniques [1]. This method provides highly accurate and stable results while still allowing us to treat lossy, optically anisotropic and dispersive materials as well as CFS-PML boundary conditions. Thus, it is very well suited to study a large variety of experimentally relevant systems.

[1] J. Niegemann, L. Tkeshelashvili, and K. Busch, "Higher-order time-domain simulations of Maxwell's equations using Krylov-subspace methods", J. Comput. Theor. Nanosci. (in press)