

# Purcell Effect Via Numerical Simulation

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## Abstract

As it is known nano-sized emitters (such as atoms, quantum dots and point defects in diamonds) interaction with nano-environment leads to drastic changes of their decay rate and therefore lifetime (Purcell effect).

To calculate the influence in general one needs to solve equations of quantum electrodynamics. However in weak interaction limit these emitters can be considered as point electric and magnetic dipoles (on multipoles of other order) and classical Maxwell equation should be solved in order to estimate influence of nano-environment on decay rate [1].

Problem of point dipole radiation in the vicinity of complicated structures should be treated carefully and for any particular case an adaptation for COMSOL Multiphysics® simulation is required. A set of these adaptation was developed and implemented for numerical simulation of electric and magnetic dipoles radiation in the vicinity of different nano-structures such as spherical nano-antennas, chiral spheres, hyperbolic media and others. Obtained numerical results are in a good agreement with analytical ones which gives strong confidence in used instruments.

## Reference

[1] Vasilii Klimov et al., Spontaneous emission of an atom in the presence of nanobodies, Quantum Electron., 31, 569 (2001)