Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Single molecule fluorescence decay rate statistics in clusters of nanoparticles LUIS FROUFE, Laboratoire EM2C, CNRS, Ecole Centrale Paris, 92295 Chatenay-Malabry, France, JUAN JOSE SAENZ, Departamento de Fisica de la Materia Condensada, Universidad Autonoma de Madrid, 28049 Madrid, Spain, REMI CARMINATI, Laboratoire EM2C, CNRS, Ecole Centrale Paris, 92295 Chatenay-Malabry, France — In this work, we study the fluorescence rate statistics of a single emitter in a finite size (nanoscopic) random medium (cluster), made of small spherical particles. For a given configuration of the system, we calculate numerically the Green tensor of the system. We deduce the spontaneous decay rate Γ, as well the radiative and the nonradiative contributions. Repeating the calculation for the configuration distribution allows to compute the full statistics. These numerical experiments are used as a basis for a physical discussion. We focus on the regime in which the statistics is determined by near field interactions, with negligible multiple scattering. The decay rate statistics is influenced by the local environment of the emitter. In particular, we show that for moderate absorption, the nonradiative contribution is proportional to the imaginary part of the dielectric function of the particles, while the radiative contribution is almost constant. An important result is that the standard deviation exhibits diferent regimes dominated by either near-field scattering or absorption. This quantity could be used for nanoscale imaging in complex media.

Luis Froufe
Laboratoire EM2C, CNRS, Ecole Centrale Paris,
92295 Chatenay-Malabry, France

Date submitted: 27 Nov 2006 Electronic form version 1.4