

LOCAL DENSITY OF STATES IN NEAR-FIELD OPTICS

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The local density of states (LDOS) of the electromagnetic field is a fundamental quantity which drives, e.g., the spontaneous emission of atoms or molecules, or thermal radiation. In this talk, we discuss the behavior of the electromagnetic local density of states (EM-LDOS) in the near field.

We describe the LDOS behavior close to metallic nanostructures (nanoparticles or tips) in the context of single-molecule fluorescence. We emphasize the interplay between radiative and non-radiative decay [1], and its consequences in terms of fluorescence enhancement and quenching.

Close to a surface, we show that the EM-LDOS is dominated by surface modes (surface plasmon or surface phonon polaritons) [2]. We discuss the possibility of measuring the LDOS in scanning near-field optical microscopy (SNOM) [3], based on an analogy between SNOM and STM [4]. We present and discuss the first experimental results showing near-field measurements of thermally-emitted light on gold structures [4]. The images can be understood as maps of the EM-LDOS of surface plasmons.

Finally, we describe the EM-LDOS fluctuations in a random cluster of nanoparticles, in the presence of near-field scattering [6]. We discuss the possibility of imaging complex media from measurements of the fluorescence lifetime fluctuations of molecules.

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