*i*NANO lecture of the week
- open to all

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Title: Coupling light to nanostructures
Time: Friday 3, September 2010, at 10:15
Coffee and bread will be served from 10:00
Location: Auditorium 3rd floor, Dept. of Physics

Abstract: There is a general recipe for achieving optimum coupling of light to resonant material systems, such as Fabry Perot resonators, super and sub wavelength structures. The extreme case for the latter is a single atom as the prototype nanostructure which will be treated in detail. This coupling between light and a single atom is probably the most fundamental process in quantum optics [1]. The best strategy for efficiently coupling light to a single atom in free space depends on the goal. If the goal is to maximally attenuate a laser beam [2-5], narrow band on resonance laser radiation is required as well as a wave front approaching the atom from a 2π solid angle [6-7]. If, on the other hand, the goal is to have a single photon bringing the atom in the excited state with its Bloch vector pointing fully upwards one will have to provide a single photon, designed to represent the time reversed wave packet which the atom would emit in a spontaneous emission process [8]. Among other conditions this requires the single photon wave packet impinging from a full 4π solid angle and having the correct temporal shape. Any deviation from the perfect shape will reduce the efficiency [9]. The state of the art is reviewed and the planned experiment is discussed [10,11]. If the interaction is strong enough it will allow for few photon quantum gates without a cavity with possible applications in quantum information processing.

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