SFB/TRR 21 - Seminar
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Prospects for a millihertz linewidth light source

In superradiance, an ensemble of atoms forms a collective dipole and emits light more strongly than the same number of independent atoms.
Since the prediction of this effect by Dicke over fifty years ago, superradiance has invariably been observed as a transient phenomenon in which a short burst of radiation is emitted. In this talk I show that it is possible to achieve superradiant emission in steady state by continuously repumping the atoms. The collective interaction between light and matter leads to interesting correlations between the atomic dipoles provided that a certain pumping threshold is achieved. An intriguing application of steady state superradiance is the possibility to generate light with a linewidth of order 1 millihertz by using alkaline-earth atoms as a gain medium. Such a light source has the potential to improve the precision of the best atomic clocks by two orders of magnitude.

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