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RHEINISCHE
FRIEDRICH-WILHELMS-UNI-
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COLLOQUIUM „OPTICS AND CONDENSED MATTER“

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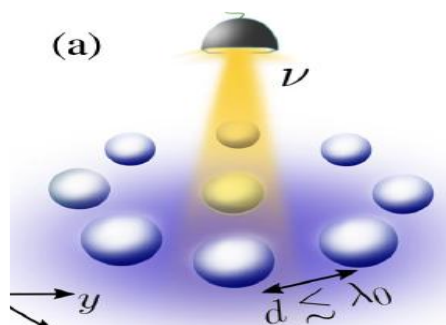
Engineered quantum dynamics in dipole coupled nano-arrays of quantum emitters

An array of closely spaced dipole coupled quantum emitters exhibits collective energy shifts as well as super- and sub-radiance with characteristic tailorable spatial radiation patterns. We identify a sub-wavelength sized ring of exactly 9 identical dipoles with an identical absorbing atom at the center as the most efficient configuration to deposit incoming photon energy to the center.

For very tight dimension below a tenth of a wavelength, a full quantum master equation description exhibits a larger enhancement than predicted from a classical coupled dipole model. Adding gain to such systems allows to design minimalistic light sources with tailorable properties. Examples are mirrorless lasers, non-classical light sources for single or entangled pair photon generation.

Such ring-shaped structures could be the basis of a new generation of highly efficient and selective nano antennas for single photon detectors or from microwaves to optical their unexpected properties could lead to understanding the efficiency of natural light harvesting molecules.

More complex structures of dipole rings are also predicted for robust and low loss long range transport with advantageous properties in several respects.



November 3rd, starting with discussion at 17:00 h, talk at 17:15 h, live IAP lecture hall or via Zoom

<https://uni-bonn.zoom.us/j/98441612025?pwd=a01SSjlkY1Q3SDFhL09JQk1qc1V6dz09>

Meeting-ID: 984 4161 2025

Kenncode: 294164



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Refs:

R Holzinger, JS Peter, S Ostermann, H Ritsch, S Yelin, Harnessing quantum emitter rings for efficient energy transport and trapping, *Optica Quantum* 2 (2)

Holzinger, R, Moreno-Cardoner M, and H.R.. "Nanoscale continuous quantum light sources based on driven dipole emitter arrays", *Appl. Phys. Lett.* 2021

M Fasser, L Ostermann, H Ritsch, C Hotter, Subradiance and superradiant long-range excitation transport among quantum emitter ensembles in a waveguide, *Optica Quantum* 2 (6), 397-403

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