

Collective response of an array of Dy atoms

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I will present our work on an experimental platform producing arrays of single dysprosium atoms [1], [2] at Institut d'Optique. The goal of the project is to study and control the collective response to light of an atomic array, benefiting from the specificity of the atomic structure of Dy. This response is modified by the resonant dipole interaction that exists between atoms driven by resonant light, which exhibits both a real (conservative) and imaginary (dissipative) part, leading to a description of the system in terms of a dissipative spin ensemble. I will focus on recent works carried out on the experiment including the single-atom resolved mapping of the distribution of the excitation through an ordered 1D array [3]. Moreover I will present improvements of the experimental setup. This includes novel techniques for ground-state cooling on dysprosium and the generation of sub-wavelength arrays of atoms in order to create subradiant states.

[1] D. Bloch *et al.*, *Phys. Rev. Lett.* **131** 203401 (2023).

[2] D. Bloch *et al.*, *Phys. Rev. A* **110** 033103 (2024).

[3] B. Hofer *et al.*, arXiv:2412.02541v1 (2024).