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A macroscopically extended coherent state in Er:YSO

Various ways to modify the absorption and emission rates of atoms or molecules have been sought in the field of quantum optics for applications such as metrology, light energy harvesting and quantum information processing.
A promising approach is based on the correlated decay of emitters (Dicke's superradiance), which can also take place in large atomic samples, including through the spontaneous formation of a macroscopic dipole, the so-called superfluorescence (SF).
We will report about realisation of SF in a solid state system, whose remarkable parameters make it an ideal test bed for quantum optics effects. In particular, this physical system might be used to test super-absorption, the conceptual counterpart of the enhanced emission process observed in our laboratory, paving the way to weak signal (photon and particle) sensing.

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