

FM 89: Introductory Talk: Quantum Light Sources

Time: Friday 9:30–10:30

Location: Audi Max

Introductory Talk FM 89.1 Fri 9:30 Audi Max
Generation of pure quantum light in the solid-state —
•PASCAL SENELLART — Center for Nanoscience and Nanotechnology
- CNRS- University Paris Saclay - 10 Bd T. Gobert, 91120, Palaiseau,
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The ability to generate light in pure quantum states is central to the development of quantum-enhanced technologies. Recently, artificial atoms in the form of semiconductor quantum dots have emerged as an excellent platform for quantum light generation [1-2]. By placing the quantum dot in an optical microcavity, pure dephasing phenomena are strongly suppressed and single photon wavepackets with very high quantum purity in the frequency domain are generated. This is demonstrated at unprecedented high efficiency that allows scaling up

linear quantum optical technologies [3]. The system is also shown to generate light pulses in a pure quantum superposition in the photon number basis, a feature that has never been demonstrated even with natural atoms. This is obtained through coherent control of the artificial atom transition: a pure quantum superposition of vacuum and one-photon is generated with a full control of their relative populations. Driving the system even stronger, a coherent superposition of vacuum, one- and two-photons is generated—a state that shows phase super-resolving interferometry [4].

[1] N. Somaschi, et al. *Nature Photonics*, 10, 340 (2016) [2] P Senellart, G Solomon, A White, *Nature Nanotechnology* 12 (11), (2017) [3] C Antón, et al., arXiv:1905.00936 [4] J. C. Laredo, C. Anton, et. al, arXiv:1810.05170, to appear in *Nature Photonics*