RESOLVING THE TEMPORAL EVOLUTION OF LINE BROADENING IN SINGLE QUANTUM EMITTERS

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Light emission from solid-state quantum emitters is inherently prone to environmental decoherence, which results in a line broadening and in the deterioration of photon indistinguishability [1]. The temporal dynamics of the dephasing mechanisms usually elude established spectroscopy methods, such as μPL and Michelson interferometry, due to relatively long integration times required. Photon correlation Fourier spectroscopy (PCFS) [2] allows to study the temporal evolution of line broadening in various photonic structures. The time scales we probe range from a few nanoseconds to milliseconds and, simultaneously, the spectral resolution we achieve can be as small as ~2μeV. We discuss the practical implementation of PCFS and the possibility to use it to estimate the indistinguishability of consecutively emitted single photons for applications in quantum communication and photonic-based quantum information processing [3].

[1] A. V. Kuhlmann, et al., Nat. Phys. 9, 570–575 (2013)
[2] X. Brokmann, et al., Opt. Express 14, 6333-6341 (2006)
[3] D. Huber, et al., Nat. Commun. 8, 15506 (2016)

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