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Using spin fluctuation correlations to reveal homogeneous linewidths within (In,Ga)As quantum dot ensembles: Two-color spin noise spectroscopy LUYI YANG, SCOTT CROOKER, Los Alamos National Laboratory, PHILIPP GLASENAPP, ALEX GREILICH, MANFRED BAYER, DMITRI YAKOVLEV, TU-Dortmund — "Spin noise spectroscopy" is a powerful optical technique for passively probing the spin dynamics of electrons and holes that is based on measuring their intrinsic spin fluctuations while in thermal equilibrium. This approach is guaranteed by the fluctuation-dissipation theorem. Here, we use the *correlation properties* of spin fluctuations to reveal the underlying homogeneous linewidth of (In,Ga)As quantum dots (QDs) in an otherwise strongly inhomogeneously-broadened ensemble. When two narrowband probe lasers are tuned in wavelength far from each other, each is sensitive only to spin fluctuations from those QDs that are spectrally close to that laser. Therefore the detected spin noise signals from each laser are uncorrelated. In contrast, when the two lasers have exactly the same wavelength, then they are sensitive to the same QDs and the spin noise signals are perfectly correlated. By measuring the degree of correlation as a function of laser detuning, we reveal the homogeneous linewidth of the QDs even in the presence of a strong inhomogeneous broadening. This information is otherwise inaccessible by conventional linear optical spectroscopic techniques.

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