Quantum Physics

Control of the direction and rate of nuclear spin flips in InAs quantum dots using detuned optical pulse trains

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We find that detuning an optical pulse train from electronic transitions in quantum dots controls the direction of nuclear spin flips. The optical pulse train generates electron spins that precess about an applied magnetic field, with a spin component parallel to the field only for detuned pulses. This component leads to asymmetry in the nuclear spin flips, providing a way to produce a stable and precise value of the nuclear spin polarization. This effect is observed using two-color, time-resolved Faraday rotation and ellipticity.

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