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【421】 Discrete-time signal processing with NV centers

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We developed a spectroscopy method for quantum sensing based on sequential weak measurements to detect the free-induction decay (FID) signal of a single carbon-13 nuclear spin. We showed that such measurements mitigate the unwanted quantum back-action, and provide a number of further advantages, including a large frequency bandwidth and possibility of efficient Fourier Nuclear Magnetic Resonance (NMR) methods. We further extended our strategy to image large nuclear spin clusters with three-dimensional atomic resolution. We demonstrated the detection of up to 29 carbon-13 nuclear spins in diamond, and showed how, by applying information-criteria principles to the detected signals, the three-dimensional atomic positions of nuclei in a diamond lattice can be recovered.

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