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Single-protein Spin Resonance Spectroscopy under Ambient Conditions

Magnetic resonance is essential in revealing the structure and dynamics of biomolecules. However, measuring the magnetic resonance spectrum of single bio-molecules has remained an elusive goal. Here, we demonstrate the detection of the electron spin resonance signal from a single spin labeled protein under ambient conditions. As sensor, we use a single nitrogen-vacancy center in bulk diamond in close proximity to the protein. We measure the orientation of the spin label at the protein and detect the impact of protein motion on the spin label dynamics. In addition, we coherently drive the spin at the protein, a prerequisite for further studies like polarizing nuclear spins of the protein or detailed structure analysis of the protein itself.

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