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Selective control of nanoscale multi-spin systems in diamond using strong pulsed field gradients RONALD WALSWORTH, Harvard-Smithsonian Center for Astrophysics, KEIGO ARAI, Massachusetts Institute of Technology, HUILIANG ZHANG, Harvard University, CHINMAY BELTHANGADY, JEAN-CHRISTOPHE JASKULA, Harvard-Smithsonian Center for Astrophysics, JUNGHYUN LEE, Massachusetts Institute of Technology — Individual control of proximal spin qubits is a key challenge in building solid-state-based quantum network architecture. Here we demonstrate selective driving of an array of electronic spins associated with nitrogen-vacancy (NV) centers in diamond with high-fidelity and nanometer-scale precision by use of frequency encoding gradient technique. A uniform magnetic field gradient of 0.1 G/nm is generated over 1 um x 5 um at room temperature by sending electric currents through micrometer-scale parallel wires. This approach also enables modulation of gradient strength at 1 MHz, which allows us to selectively readout Larmor precession phase of proximal NV spins via phase encoding.

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