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Scanned probe imaging of nanoscale magnetism at cryogenic temperatures with a single-spin quantum sensor MATTHEW PELLICCIONE, ALEC JENKINS, PREETI OVARTCHAIYAPONG, CHRISTOPHER REETZ, University of California, Santa Barbara, EVE EMMANUELIDU, NI NI, University of California, Los Angeles, ANIA BLESZYNSKI JAYICH, University of California, Santa Barbara — The nitrogen vacancy (NV) defect in diamond has emerged as a promising candidate for high resolution magnetic imaging based on its atomic size and quantum-limited sensing capabilities afforded by long spin coherence times. Although the NV center has been successfully implemented as a nanoscale scanning magnetic probe at room temperature, it has remained an outstanding challenge to extend this capability to cryogenic temperatures, where many solid-state systems exhibit non-trivial magnetic order. In this talk, we present NV magnetic imaging at $T = 6$ K, first benchmarking the technique with a magnetic hard disk sample, then utilizing the technique to image vortices in the iron pnictide superconductor $BaFe_2(As_{0.7}P_{0.3})_2$ with $T_c = 30$ K. In addition, we discuss other candidate solid-state systems that can benefit from the high spatial resolution and field sensitivity of the scanning NV magnetometer.

Matthew Pelliccione
University of California, Santa Barbara

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