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Quantum sensing at high pressures using the nitrogen-vacancy center[1] T. O. HOEHN, S. HSIEH, P. BHATTACHARYYA, C. ZU, T. MITTIGA, T. SMART, F. MACHADO, B. KOBRIN, N. RUI, University of California, Berkeley, M. KAMRANI, Iowa State University, S. CHATTERJEE, S. CHOI, M. ZALETEL, University of California, Berkeley, V. STRUZHKIN, Carnegie Institution of Washington, J. MOORE, University of California, Berkeley, V. LEVITAS, Iowa State University, R. JEANLOZ, N. YAO, University of California, Berkeley — The nitrogen-vacancy (NV) center in diamond is a promising nanoscale sensor for temperature, strain, electric and magnetic fields. Employing this suite of sensing techniques in a high pressure environment represents an important challenge at the interface of fields ranging from geophysics to condensed matter. To this end, we introduce a new sensing platform based upon directly integrating NV centers into the culet of diamond anvil cells (DAC) – one of the workhorses of high-pressure science. We demonstrate the capability of this platform by performing diffraction-limited imaging of stress fields, quantifying all six (normal and shear) stress tensor components, as well as vector magnetic fields in iron and gadolinium up to pressures of 60 GPa and for temperatures ranging from 25 to 340 K. In addition to DC vector magnetometry, we highlight a complementary NV-sensing modality using T_1 noise spectroscopy.

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