Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Towards quantum sensing at megabar pressures using nitrogen vacancy centers in diamond PRABUDHYA BHATTACHARYYA, SATCHER HSIEH, THOMAS MITTIGA, CHONG ZU, THOMAS SMART, University of California, Berkeley, ZACHARY GEBALLE, Carnegie Institution for Science, Washington DC, NICHOLAS RUI, University of California, Berkeley, TIM HOEHN, Ludwig Maximilian University, Munich, BRYCE KORBIN, FRANCISCO MACHADO, BRIAN CHASE CHANDLER, University of California, Berkeley, VIKTOR STRUZHKIN, Center for High Pressure Science Technology Advanced Research, Shanghai, RAYMOND JEANLOZ, NORMAN YAO, University of California, Berkeley, YAO LAB TEAM, JEANLOZ LAB TEAM — The nitrogen vacancy (NV) color center in diamond has emerged as a robust and versatile sensor for a wide range of applications. The recent incorporation of NV centers into diamond anvil cells - the workhorse technology of high pressure science - has enabled the direct imaging of pressure-driven phenomena. In particular, by implanting a shallow layer of NV centers near the anvil cell's culet, one can map the magnetic field vector and the stress tensor with diffraction limited spatial resolution. Despite this progress, a number of challenges remain. Most importantly, prior experiments suggest that NV sensing cannot be performed above ˜60 GPa of pressure owing to a sharp reduction of the NV center's contrast as a function of increasing pressure. To this end, we introduce a new approach that enables NV spectroscopy to be performed at well above 100 GPa (megabar) pressures, opening the door for the exploration of high-temperature, pressure-induced superconductivity in the hydrides.

Prabudhya Bhattacharyya
University of California, Berkeley

Date submitted: 31 Jan 2020 Electronic form version 1.4