Magnetometry based on Nitrogen-Vacancy centers in diamond: Fundamental to Probing condensed matters

Prof. Amir Yacoby
Dept. of Physics, Harvard University, USA

***Abstract*:**

The magnetic fields generated by spins and currents provide a unique window into the physics of correlated-electron materials and devices. Proposed only a decade ago, magnetometry based on the electron spin of nitrogen-vacancy (NV) defects in diamond is emerging as a platform that is exceptionally suited for probing condensed matter systems: it can be operated from cryogenic temperatures to above room temperature, has a dynamic range spanning from DC to GHz, and allows sensor-sample distances as small as a few nanometers. As such, NV magnetometry provides access to static and dynamic magnetic and electronic phenomena with nanoscale spatial resolution. While pioneering work focused on proof-of-principle demonstrations of its nanoscale imaging resolution and magnetic field sensitivity, now experiments are starting to probe the correlated-electron physics of magnets and superconductors and to explore the current distributions in low-dimensional materials. In this talk, I will review some of our recent work which uses NV center magnetometry to image skyrmions in thin magnetic films, measure the spin chemical potential in magnetic insulators, and image hydrodynamic electron flow in graphene.