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Nanoscale magnetic sensing with stationary and mobile NV centers

Diamond has emerged as a unique material for a variety of applications, both because it is very robust and because it has defects with interesting properties. One of these defects, the nitrogen-vacancy center, has a single spin associated with it that show quantum behavior up to room temperature. Our group is harnessing the properties of single NV centers for high resolution magnetic sensing applications. In this talk, I will give an introduction into our group's effort in diamond-based magnetic sensing. I will show how NV centers can be embedded in nanostructures suitable for scanning probe microscopy, and present initial experiments with such a scanning NV sensor. I will highlight the importance of the diamond material, and in particular the diamond surface, for improving the properties of near-surface (≤ 10 nm) NV defects. Finally, I will discuss recent attempts of our group to perform NMR detection of small ensembles of proton spins, and ultimately a single proton spin, that is deposited on the surface of a diamond chip.

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