Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Atomic-scale nuclear spin imaging using quantum-assisted sensors in diamond ASHOK AJOY, Massachusetts Inst of Tech-MIT, ULF BISSBORT, Singapore University of Technology and Design, YIXIANG LIU, LUCA MARSEGLIA, KASTURI SAHA, PAOLA CAPPELLARO, Massachusetts Inst of Tech-MIT — Recent developments in materials fabrication and coherent control have brought quantum magnetometers based on electronic spin defects in diamond close to single nuclear spin sensitivity. These quantum sensors have the potential to be a revolutionary tool in proteomics, thus helping drug discovery: They can overcome some of the challenges plaguing other experimental techniques (x-ray and NMR) and allow single protein reconstruction in their natural conditions. While the sensitivity of diamond-based magnetometers approaches the single nuclear spin level, the outstanding challenge is to resolve contributions arising from distinct nuclear spins in a dense sample and use the acquired signal to reconstruct their positions. This talk describes a strategy to boost the spatial resolution of NV-based magnetic resonance imaging, by combining the use of a quantum memory intrinsic to the NV system with Hamiltonian engineering by coherent quantum control. The proposed strategy promises to make diamond-based quantum sensors an invaluable technology for bioimaging, as they could achieve the reconstruction of biomolecules local structure without the need to crystallize them, to synthesize large ensembles or to alter their natural environment.

Paola Cappellaro
Massachusetts Inst of Tech-MIT

Date submitted: 30 Jan 2015 Electronic form version 1.4