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Using NV centers to probe magnetization dynamics in normal metal/magnetic insulator hybrid system at the nanoscale HUILIANG ZHANG, MARK J.H. KU, Harvard-Smithsonian Center for Astrophysics and Harvard University, MINYONG HAN, Harvard University, FRANCESCO CASOLA, Harvard-Smithsonian Center for Astrophysics and Harvard University, TOENO VAN DER SAR, AMIR YACOBY, Harvard University, RONALD L. WALSWORTH, Harvard-Smithsonian Center for Astrophysics and Harvard University — Understanding magnetization dynamics induced by electric current is of great interest for both fundamental and practical reasons. Great endeavor has been dedicated to spin–orbit torques (SOT) in metallic structures, while quantitative study of analogous phenomena in magnetic insulators remains challenging where transport measurements are not feasible. Recently we have developed techniques using nitrogen vacancy (NV) centers in diamond to probe few-nanometre-scale correlated-electron magnetic excitations (i.e., spin waves). Here we demonstrate how this powerful tool can be implemented to study magnetization dynamics inside ferromagnetic insulator, Yttrium iron garnet (YIG) with spin injection from electrical current through normal metal (Platinum in our case). Particularly our work will focus on NV magnetic detection, imaging, and spectroscopy of coherent auto-oscillations in Pt/YIG microdisc. Magnetic fluctuations and local temperature measurements, both with nearby NV centers, will also be interesting topics relevant to SOT physics in Pt/YIG hybrid system.

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