

Abstract Submitted
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Design of Rectangular Coils for Control of Magnetic Fields¹ RYAN DANIELS, CHANGGONG ZHOU, Lawrence Technological University — Over the last decade, cylindrical cross-section (CCS) coils have encompassed the majority of studies (i.e., “Double-Helix” coils): predominantly for use in particle accelerators (Goodzeit et al., Rochford et al., and Tominaka et al.). In this study, we investigate single and double-layered rectangular cross-section (RCS) coils of different inclination angles. RCS coils are a novel design, which does not require special machining of grooves on supporting structure for precise assembly of coils, and may lead to cost reduction. Numerical calculation of the field based on Biot-Savart’s Law is conducted using Mathematica. Our goal is to generate a static and controllable time-varying magnetic field using a special configuration of four RCS coils, and impose the field on magnetic nanoparticles levitated by optical forces to study their behavior. The calculation provides guidance for optimizing the magnetic field in this application. Our current results indicate that the configuration produces highly uniform and controllable magnetic fields in the region where the nanoparticles are levitated.

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