

Precision Electromagnetic Coil Design Using The Scalar Magnetic Potential

C. B. Crawford¹

¹University of Kentucky, Lexington, KY, USA

Abstract

As post-LHC particle accelerators of higher energy become prohibitively expensive, physicists are turning to precision low-energy measurements of fundamental symmetries as an avenue for the discovery of new physics. A common requirement of many of these experiments is precision magnetic coils, used, for example, to measure the spin precession frequency of elementary particles. We present a practical technique for designing these coils based on a novel physical interpretation of the magnetic scalar potential. Whereas most magnets are designed by calculating the magnetic fields produced by specific coils, this method uses COMSOL® to calculate the winding geometry for coils needed to produce specific magnetic fields. I will describe the general technique through examples of specialty coils designed using this method.