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A New Tool for Optimizing Finite-build Stellarator Coils¹

LUQUANT SINGH, THOMAS KRUGER, AARON BADER, University of Wisconsin - Madison, CAOXIANG ZHU, STUART HUDSON, Princeton Plasma Physics Laboratory, DAVID ANDERSON, University of Wisconsin - Madison — Finding coil sets with desirable physics and engineering properties is a crucial step in the design of modern stellarator devices. Existing stellarator coil optimization codes ultimately produce zero-thickness filament coils. However, stellarator coils have finite depth and thickness, which can make the single-filament model a poor approximation, particularly when coil build dimensions are large compared to the coil-plasma distance. We present a new method for designing coils with finite builds using a multi-filament model and present a mechanism to optimize the orientation of the winding pack. We show optimization results from the numerical implementation OMIC (Optimization of Multi-filament Coils) [1] for the HSX stellarator and a new UW-Madison QHS configuration [2]. [1] L. Singh, T. Kruger et al., Optimization of Finite-build Stellarator Coils, Accepted to JPP June 2020. [2] A. Bader et al., Advancing the Physics Basis for Quasihelically Symmetric Stellarators, Submitted to JPP June 2020.

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