

## **REACTOR CONFIGURATION DEVELOPMENT FOR ARIES-CS\***

L. P. Ku and the ARIES Team

Princeton Plasma Physics Laboratory, PO Box 451, Princeton, NJ 08543-0451

lpku@pppl.gov

ARIES-CS, a multi-institution project launched three years ago, is aimed at studying the attractiveness and competitiveness of drift-orbit optimized stellarators as power producing reactors. One of the key elements in this project is to identify plasma engineering issues relevant to a compact stellarator reactor and to find configurations that are optimized with respect to the components critical to a reactor performance. These include plasma aspect ratios in relation to the attainable quasi-symmetry,  $\alpha$  loss and its minimization, equilibrium and MHD beta limits, and the quality of flux surfaces. The main focus has been on the quasi-axially symmetric magnetic topology because reactors having this property can be designed with less number of field periods and smaller aspect ratios, hence more compact.

In this paper we summarize the approaches taken, discuss the optimization techniques developed and show attractive classes of configurations recently identified. In particular, we shall demonstrate that it is possible to choose external rotational transform judiciously to avoid undesirable effects of low order resonances on the flux surface integrity and that there exists a family of ultra-low aspect ratio configurations possessing excellent quasi-axial symmetry and low field ripples.

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