Novel Magnetic Geometries to Cure the Divertor Heat Flux Problem for Reactors

P. Valanju, M. Kotschenreuther, J.C. Wiley, M. Pekker, (IFS, University of Texas), and *D. Strickler (ORNL)*

Coil designs are developed for novel magnetic divertor geometries with a *second* axi-symmetric x-point and flux expansion region along the separatrix. Adjacent posters describe how these lead to spreading of heat flux and the possibility of stable, complete detachment to overcome serious physics and engineering problems in reactors. The principal feasibility issue is creating, with simple coils, additional X-points on the separatrix without extensively deforming the magnetic field in the main plasma. For the spherical tokamak NSTX, we show that adding one or two poloidal coils suffices to create a divergent flux at the divertor, i.e., a new x-point. The currents and forces for the extra coils are small. We also modify the ARIES ST design to show reactor feasibility. Optimized coil designs for PEGASUS, ARIES RS/AT, and a modular ITER retrofit are also being developed. For our calculations we used self consistent code FBEQ, which was used to design NSTX. We also use NCSX tools for optimization of designs with competing physics and engineering constraints.