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Targeted Physics Optimization in the HSX Stellarator[1] JOSEPH TALMADGE, BENJAMIN FABER, HSX Plasma Laboratory — To plan out future experiments in HSX, we have developed a code to vary the currents in the auxiliary coils and optimize for specific target physics functions. One such function is related to the bounce-averaged grad-B drift velocity of trapped particles such as alphas in a fusion reactor. In an HSX reactor, the alpha particle confinement is degraded because of the modular coil ripple. Increasing the number of coils improves the alpha confinement, but also leads to an increase in the effective ripple. Thus, minimizing effective ripple by itself is not a sufficient figure of merit for energetic particle confinement. Of particular interest for optimization is the exploration of configurations in HSX which can lower turbulent transport. Optimizing for ITG turbulence in HSX configuration can be achieved so that the calculated saturated turbulent heat flux is reduced by a factor of 2 from the standard QHS configuration. However, experimental data showed that the confinement was degraded in the new configuration; gyrokinetic calculations confirm that TEM and ETG are the dominant microinstabilities in HSX, not ITG. Present optimization studies are focused on plasma flows and TEM stabilization.

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