Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Upgrade of the Helically Symmetric eXperiment (HSX) with a new 70 GHz gyrotron[1] BENEDIKT GEIGER, DAVID ANDERSON, SIMON ANDERSON, AARON BADER, CHUANBAO DENG, SANTHOSH KUMAR, KONSTANTIN LIKIN, JOSEPH TALMADGE, University of Wisconsin - Madison, HSX TEAM — HSX is a neoclassically optimized stellarator with major and minor radii of 1.2 and 0.12 m, respectively. It has been operated successfully since 2001 and demonstrated improved neo-classical confinement and strong turbulent heat transport in the electron channel. However, studies of the neoclassical and turbulent ion-heat transport have been challenging since the available 28 GHz ECRH system can only be applied during low-density plasmas to avoid cut-off. Thus, an additional 70 GHz, 500 kW gyrotron, previously used at W7-AS, is being installed which will be operated in the X2 polarization scheme, requiring a 25% increase of the magnetic field strength of HSX. With the new heating system, plasma experiments with 3x higher densities and about 5x more absorbed heating power will become possible. 1D modelling results of the expected performance will be presented that predict increased coupling between electrons and ions and a reduced level of charge-exchange losses due to the increased density. In combination with the application of new wall-cleaning techniques and strike-line protection, this might provide ion-temperatures on the order of 300 eV such that the ion confinement can be addressed for the first time in a quasi-symmetric stellarator experiment featuring low collisionality.

[1]Supported by US DOE under grant DE-FG02-93ER54222

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Date submitted: 09 Aug 2019 Electronic form version 1.4