Measurement of Flows in the HSX Stellarator Demonstrating the Importance of Momentum-Conservation in Neoclassical Flow Modeling

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— The flow velocity of carbon ions is measured using a Charge Exchange Recombination Spectroscopy (CHERS) system on the Helically Symmetric Experiment (HSX), a quasi-helically symmetric stellarator. Intrinsic parallel flow speeds of up to 20 km/s have been measured. The parallel velocity is compared to the predictions of the PENTA code [1-2]. Multiple ion species, including the species used for the CHERS measurements, are included in the calculations. PENTA is a neoclassical code that includes the effects of momentum-conservation, which are often neglected for nonsymmetric stellarators. Without momentum conservation the parallel flow velocity in HSX is under-predicted by approximately an order of magnitude. Agreement is seen between the measured and calculated parallel flows when momentum conservation is included.


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