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Fast ion beta limit measurements by collimated neutron detection in the MST WILLIAM CAPECCHI, JAY ANDERSON, SCOTT EILERMAN, JON KOLINER, JOSH REUSCH, University of Wisconsin, Madison, LIANG LIN, UCLA, DEYONG LIU, UC Irvine — Fast ion orbits in the reversed field pinch (RFP) magnetic configuration are well ordered and have low orbit loss, even considering the stochasticity of the magnetic field generated by multiple tearing modes. Purely classical TRANSP modeling of a 1MW tangentially injected hydrogen neutral beam in MST deuterium plasmas predicts a core-localized fast ion density that can be up to 25% of the electron density and a fast ion beta of many times the local thermal beta. However, neutral particle analysis of an NBI-driven mode (presumably driven by a fast ion pressure gradient) shows transport of core-localized fast ions and a saturated fast ion density. The TRANSP modeling is presumed valid until the onset of the beam driven mode and gives an initial estimate of the volume-averaged fast ion beta of 1-2% (local core value up to 10%). A collimated neutron detector for fusion product profile measurements is in development to determine the energy and spatial distribution of fast ions, the design of which is informed by recent neutron moderation measurements with polyethylene. Characterization of both the local and global fast ion beta will be done for deuterium beam injection into deuterium plasmas for comparison to TRANSP predictions. Work supported by US DOE.

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