Contribution ID: **25** Type: **Poster**

Characterization of Intermittent Fast Ion Transport in DIII-D

Wednesday, 4 September 2019 15:15 (15 minutes)

Fast ion loss detector (FILD) measurements indicate intermittent bursts of losses associated with Alfvén Eigenmode (AE) induced critical-gradient transport [1]. During the current ramp phase of a DIII-D inner wall limited, oval shaped, L-mode plasma with reversed-shear magnetic safety factor profile, the total AE activity increases with neutral beam injected (NBI) power. A mix of both frequency sweeping reversed-shear Alfvén eigenmodes (RSAEs) and near-constant frequency toroidicity induced Alfvén eigenmodes (TAEs) are also observed. As the beam power increases from 2.4 to 9.2 MW, the frequency and amplitude of fast-ion fluctuations increases, and a skewed tail emerges in the distribution of loss events. The addition of electron cyclotron heating changes the types of AEs present, increases the measured fast-ion density, and alters loss behavior [2]. New fluctuation measurements from an upgraded bank of FILD, fast-ion D-alpha, and imaging neutral particle analyzer diagnostics will be presented. In theory, intermittency is associated with the domino effect, where avalanches of global redistribution and losses can occur when many overlapping modes provide a channel for particle transport over a larger portion of phase space [3]. Quantification of intermittent transport is important for model validation, particularly for simplified critical gradient transport models that do not account for time dynamics. Furthermore, these experiments suggest that losses can be altered, or perhaps 'smeared out' using active control to manipulate AE mode activity.

Work supported by U.S. Department of Energy under DE-FC02-04ER54698, DE-FG03-94ER54271, and DE-AC02-09CH11466.

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Session Classification: Poster

Track Classification: Transport of Energetic Particles