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Automated Characterization of Rotating MHD Modes and Subsequent Locking in a Tokamak JUAN RIQUEZES, Univ of Michigan - Ann Arbor, STEVEN SABBAGH, JACK BERKERY, Columbia University — Disruption avoidance in tokamaks is highly desired to maintain steady plasma operation, and is critical for future reactor-scale devices, such as ITER, to avoid potential damage to device components. This high priority research is being conducted at PPPL by analyzing data from NSTX and its upgrade, NSTX-U. A key cause of disruptions is the physical event chain that comprises the appearance of rotating MHD modes, their slowing by resonant field drag mechanisms, and their subsequent locking. The present research aims to define algorithms to automatically find and characterize such physical event chains in the machine database. Characteristics such as identification of a mode locking time based on a loss of torque balance and bifurcation of the mode rotation frequency are examined to determine the reliability of such events in predicting disruptions. A goal is to detect such behavior as early as possible during a plasma discharge, and to further examine potential ways to forecast it. This capability could be used to provide a warning to use active mode control as a disruption avoidance mechanism, or to trigger a controlled plasma shutdown if desired.
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