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Magnetohydrodynamic simulation study of plasma jets and plasma-surface interactions in coaxial plasma accelerators VIVEK SUBRAMANIAM, LAXMINARAYAN RAJA, The University of Texas at Austin — Coaxial plasma accelerators belong to a class of electromagnetic acceleration devices that utilize the Lorentz force generated by self-induced magnetic fields to accelerate high density thermal plasmas to large velocities (10Km/s). A MHD simulation study of the coaxial plasma accelerator is performed to elucidate the physical mechanisms responsible for the formation of these hypervelocity plasma jets. Distinct modes of jet-formation are identified based on the prefill conditions in the accelerator. The plasma jet is used as a high energy density source to mimic the extreme stagnation conditions generated on the confining walls of fusion reactors during Edge Localized Mode (ELM) type disruption events. This is achieved by impinging the jet on a target material surface placed normal to the jet trajectory. The MHD simulations are used to resolve the transient shock structure that develops on the target surface during the course of the plasma-surface interaction event. The jet-target impact studies indicate the existence of two distinct stages involved in the plasma-surface interaction. A fast transient stage characterized by a thin normal shock that transitions into a pseudo-steady stage that exhibits an extended oblique shock structure.

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