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Plasma Formation and Ablation Dynamics of Metallic Liner

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The formation of plasma and ablation dynamics of metallic liner z-pinch is investigated. The size of 2mm in diameter, 0.1mm in thickness liners are exploded on the Qin-1 facility (~250ns, 300kA). Radial and axial laser diagnostic platforms are set up to observe the dynamics from different direction simultaneously. We use screws to fix the liner which constructs a special point-contact structure. Consequently, we can study the plasma formation at the outside surface and inside surface during the whole process. According to the interferometry fringe shift, the electron density distribution is investigated. The formation of plasma at inside surface is about 20ns after the formation of plasma at outside surface. While the major part of liner keeps stationary, plasma generated from inside surface moves inward with ~100 km/s and accumulates at center which is similar to the precursor of wire array Z-pinch. Meanwhile, a high density plasma layer is established at outside surface and the outside plasma expands outward with only 10-20 km/s.

The perturbations development at outside surface are investigated through transverse laser shadow image. We consider the stratifications as pure MHD (m=0) instabilities rather than ETI (electro-thermal instabilities) because the major part of ablations are plasma. We also discussed the growth law of wavelength and amplitude of perturbations.

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