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Combining a plasma gun and theta-pinch to study plasma-facing components under fusion-relevant conditions SOONWOOK JUNG, MICHAEL CHRISTENSON, DAVIDE CURRELI, DANIEL ANDRUCZYK[1], DAVID RUZIC, CPMI, Department of Nuclear, Plasma, and Radiological Engineering, University of Illinois at Urbana-Champaign, Urbana, IL, 61801, USA — A recent paper [D.N.Ruzic et al. Nuclear Fusion 51, 102002, 2011] on lithium-metal infused trenches shows that liquid lithium in metal trench flows by thermoelectric magneto-hydrodynamic force in such a way that it removes the heat flux and refreshes the surface with pure lithium. To further investigate behaviors of the liquid flow in a similar condition to extreme events in a tokamak, development of a high energy pulsed plasma simulator has been proposed. The new plasma simulator consists of mainly two components: a plasma gun to provide preionized high density plasma and directional momentum, and a theta pinch to magnetically heat up the plasma. The use of the theta pinch efficiently increases the ion temperature and creates similar conditions to an ELM in a tokamak. A gas-puff system has been developed to reduce neutral atom collisions with the hot plasma. Diagnostics include a triple Langmuir probe, an optical time-of-flight, a gridded ion energy analyzer and calorimetry. These quantitatively estimate plasma parameters to understand the effect of combining the plasma gun with the theta-pinch.

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