Design and Preliminary Results of a Recyclable Transmission Line Testing Experiment*

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Recyclable transmission lines (RTL) have recently been of interest to the inertial confinement fusion and pulsed power community as a means to increase repetition rate and decrease cost per shot in Z-pinch driven inertial confinement fusion devices [1-3]. The ability to remove surface contaminants from the surface of RTLs is important to their successful operation. These contaminants, which consist of residual atmospheric gases and hydrocarbons, physically and chemically adsorb to the transmission line surfaces. Some contaminants have sufficient binding energies such that they are not desorbed even in vacuums as high as $10^{-6}$ Pa at room temperature. When a pulse is initiated, remaining contaminants are rapidly emitted through joule heating and stimulated desorption, causing local pressures to increase as high as $10^3$ Pa [4]. These areas of local high pressure support plasma formation, which leads to breakdown and loss of power delivery capability in the transmission line. In order to satisfy the RTL concept, conditioning of the transmission lines to remove contamination prior to shot must be done quickly and in situ. A new magnetically insulated transmission line (MITL) with repetitive pulse capability is being designed and installed on the 1-MA linear transformer driver at the University of Michigan to evaluate in situ conditioning methods. This test-bed will evaluate the effect of multiple "conditioning pulses" on contaminant inventory and ability to improve MITL power flow. Preliminary findings will be presented.

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