Abstract Submitted
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An Electrothermal Plasma Source Developed for Simulation of Transient Heat Loads in Future Large Fusion Devices.[1] TREY GEBHART, Univ of Florida - Gainesville, LARRY BAYLOR, Oak Ridge National Laboratory, LEIGH WINFREY, Univ of Florida - Gainesville — The realization of fusion energy requires materials that can withstand high heat and particle fluxes at the plasma material interface. In this work, an electrothermal (ET) plasma source has been designed as a possible transient heat flux source for a linear plasma material interaction device. An ET plasma source operates in the ablative arc regime, which is driven by a DC capacitive discharge. The current travels through the 4mm bore of a boron nitride liner and subsequently ablates and ionizes the liner material. This results in a high density plasma with a large unidirectional bulk flow out of the source exit. The pulse length for the ET source has been optimized using a pulse forming network to have a duration of 1ms at full-width half maximum. The peak currents and maximum source energies seen in this system are 2kA and 5kJ. The goal of this work is to show that the ET source produces electron densities and heat fluxes that are comparable to transient events in future large magnetic confinement fusion devices. Heat flux, plasma temperature, and plasma density were determined for each test shot using infrared imaging and optical spectroscopy techniques. This work will compare the ET source output (heat flux, temperature, and density) with and without an applied magnetic field.

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