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A Multi-Material Velocimetry Detector for Pulsed Power Flow Studies

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Pulsed power experiments at Sandia National Laboratories' Z Pulsed Power Facility have traditionally utilized single material velocimetry flyers for diagnosing magnetic pressure, and hence current, within the magnetically insulated transmission lines (MITLs). More recent experiments at Sandia suggest that energy absorption through various mechanisms, such as charged particle loss, can contribute to the measured motion of flyers as well. In order to further test this hypothesis, we have fielded flyers that are both single material, such as aluminum, and multi-material flyers, such as a combined substrate of gold and aluminum, to detect particle energy absorption on the MITL. Since each flyer material has a unique charged particle stopping power, as well as a unique sound speed, then the simultaneous velocimetry response of two different detectors can provide information about the types of charged particles depositing their energy, as well as their time-dependent energy deposition. Our presentation explains the physics of these detectors, and shows the experimental measurements from these detectors.

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