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Measurement of the Effective Length of Laser-Plasma Channels by Guided Microwave Backscattering[1] MARK GILMORE, University of New Mexico, BRIAN STOLTZFUS, MARK SAVAGE, Sandia National Laboratories, ALAN LYNN, University of New Mexico — Laser triggered gas switches are critical components in many pulsed power driven systems, such as ZR at Sandia National Laboratories. Timing jitter is of concern is such systems, where power flow from multiple modules must be switched to a load simultaneously. Laser triggered gas switches utilize a laser-produced plasma channel (LPPC) to initiate breakdown between electrodes biased to $\sim 80\%$ of breakdown voltage. The effective length of the LPPC is an important parameter affecting the breakdown timing. Backscattering of microwaves inside a waveguide by an LPPC, introduced by focusing the trigger laser through holes in the broad wall, has been used to characterize effective length of the channel. Simulations indicate that the backscattering is sensitive to the LPPC conductor length both inside and outside the waveguide. A quarter wavelength stub has therefore been introduced outside of the waveguide, to short circuit the LPPC conductor to the waveguide wall, while still allowing laser access. Theoretical, computational, and initial plasma channel experimental results, as well as comparisons with other diagnostics, are presented.

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Mark Gilmore
University of New Mexico

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