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Development of the Axial Instability in Low Wire Number Wire Array Z-Pinches PATRICK KNAPP, JOHN GREENLY, PIERRE GOURDAIN, CAD HOYT, MATTHEW MARTIN, SERGEI PIKUZ, TANIA SHELKOVENKO, DAVID HAMMER, BRUCE KUSSE, Cornell University — We investigate the growth of the axial instability in wire-array Z-pinches. In these experiments we image individual wires in aluminum wire arrays using laser shadowgraphy and XUV framing cameras at times ranging from 0 to 100 ns after the start of a 1 MA, 100 ns rise time current pulse. We document the radial growth of the coronal plasma around each wire and the development of the wavelength and amplitude of the instability from the time of plasma formation until the instability stops growing. The ratio of the dominant instability wavelength to the coronal plasma radius is $\sim$1 during this time. The magnetic field topology is also probed using small B-dot probes inside the array. The change in topology from local- to global- field dominated near an exploding wire correlates well in time with the moment that the instability stops growing. In addition, preliminary experiments show that perturbations seeded in the coronal plasma using twisted wires grow at the twist wavelength and evolve to much larger amplitude than in the unseeded case. This research was supported by the SSAA program of the National Nuclear Security Administration under DOE Cooperative agreement DE-FC03-02NA00057.

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