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Improving Agreement between the Neutron Yield Scaling Model of Fast Z-pinches with Experimental Data Using the Time Derivative of the Current BRIAN BURES, MAHADEVAN KRISHNAN, Alameda Applied Sciences Corporation — The Z-pinch community has accepted a power law scaling of the DD neutron yield with current (Y=aI^d) for decades. While the exponent, d, in the power law has received much of the attention in literature (3.5<d<5), the constant, a, relating the neutron yield and the current has received little attention. Yet once an exponent is selected, typically around 4, the experimental data are observed to show a standard deviation of 3000% or more relative to the model prediction with a scalar value for a. We have revised the long standing scaling relationship by replacing this scalar constant with a linear function of the minimum in the time derivative of the current (Y=(bdI/dt+c)I^d). Our revised scaling relationship reduces the standard deviation in DD neutron yield to ~100% from 25,000%, on Z-pinch machines with peak currents ranging from 60 kA to 18 MA. The improved correlation of measured yield on both I and dI/dt motivates an examination of microscopic dynamics in these pinches., The dI/dt term is related to the pinch voltage that in turn is the source term for the fast ion spectrum that drives beam-target fusion.

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