Abstract Submitted
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A conservative approach to scaling magneto-inertial fusion concepts to larger drivers[1] PAUL SCHMIT, DANIEL RUIZ, Sandia National Laboratories — We propose a conservative approach to scaling magneto-inertial fusion (MIF) platforms to larger drivers. Using simple physics models capturing the essential elements of MIF implosions, we identify a set of dimensionless parameters whose conservation leads to self-similar implosions at all energy scales. Our approach establishes basic scaling criteria to map present-day implosions to higher energies while preserving or lessening the impact of MHD implosion instabilities and fuel energy losses (e.g., conduction, radiation, bulk flows) while steadily improving thermonuclear yield and ignition performance metrics. The same scaling rules can provide a unique mapping of an aspirational scaled-up experimental design to a platform that could be tested on present-day facilities. Our scaling strategies maintain flexibility with respect to future pulsed-power architectures by allowing arbitrary scaling of the current rise time. In summary, our analytic scaling studies provide a starting point for MIF target designers to scale targets up or down in coupled energy while maintaining as much of the underlying physics as possible, controlling and/or mitigating the impact of known physics risk factors, and shifting risk toward areas where present-day designs have exhibited sufficient margin.

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