SAND2012-8828P

Collaboration Slides to share with Sasha Velikovich, Naval Research Laboratories

Compression of a Bz field by a Be liner imploded on the Z generator, and the role of the nernst term in field compression of a pre-heated D-T fuel

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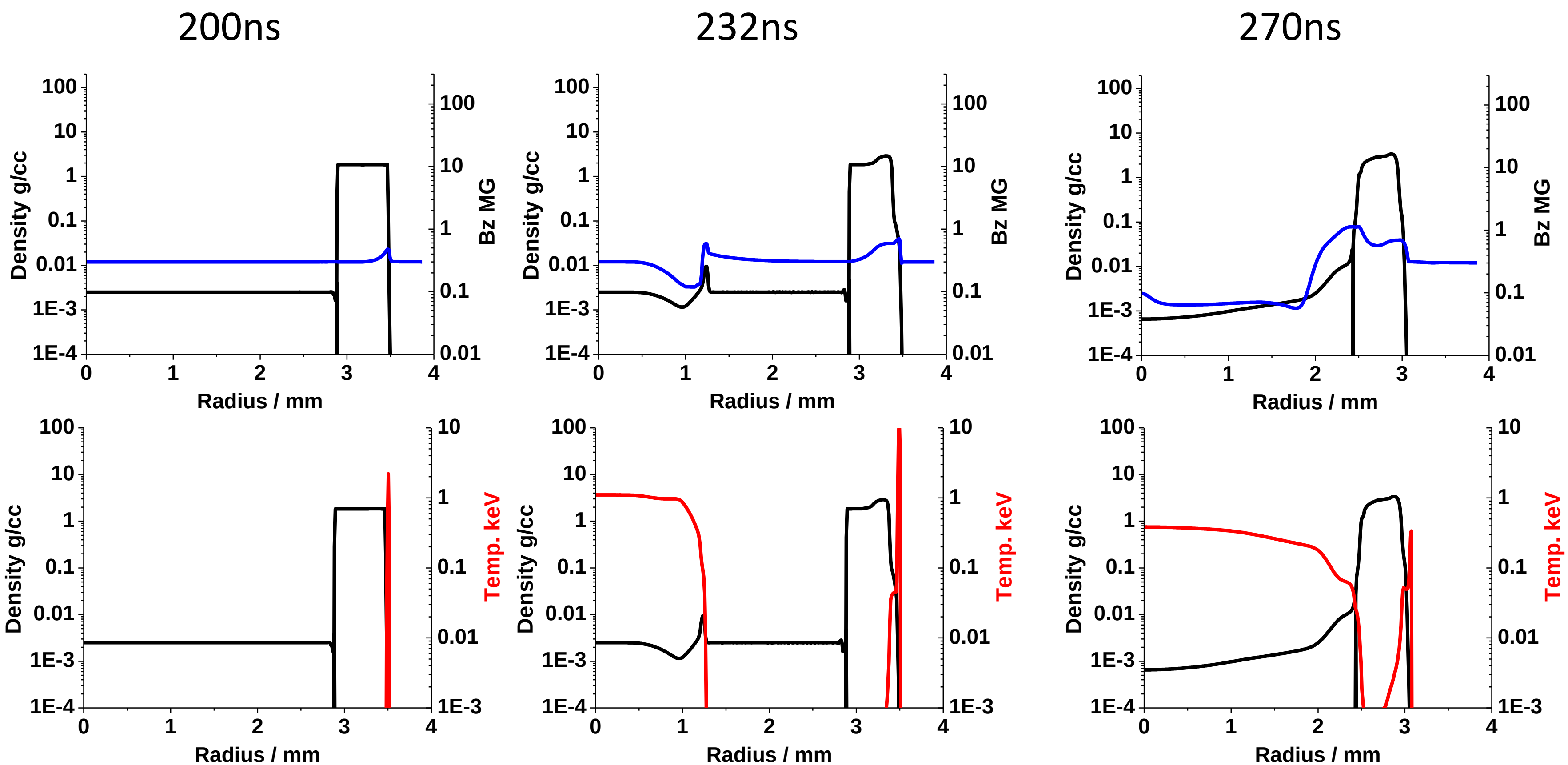
Time History of early stages of implosion. Temperature and Magnetic Field

2ns laser preheat starts 230ns (2mm diameter)



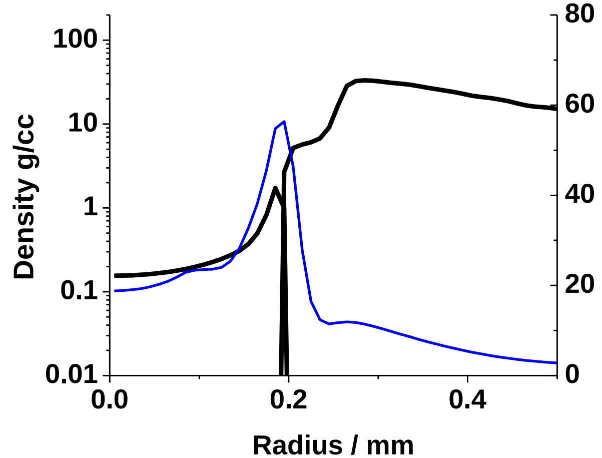
Aspect Ratio 6 Liner (Be)
Inner radius 2.89mm, Outer radius 3.47mm. Initial fuel density 2.5Kg/m^3
Driven by ~28MA in 100ns (bit high for Z)
Laser depositing ~10kJ in 2ns, in center beam diameter 2mm
Lee-Moore-Desjarlais resistivities used

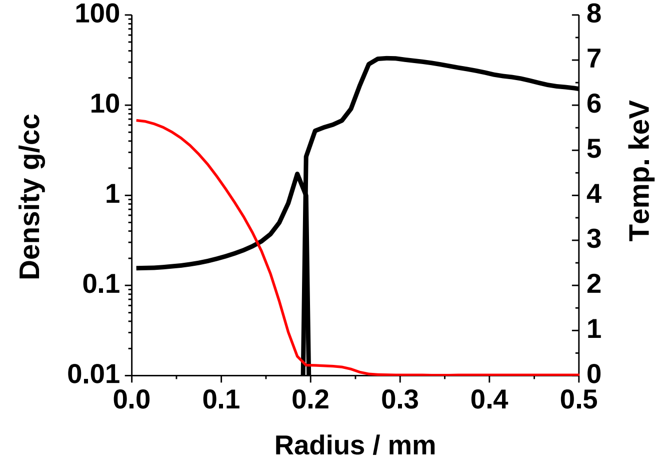
Nernst term has capacity to affect Bz distribution, and hence temperature / density distribution in stagnated plasma

Profiles ~2ns before peak in fusion power

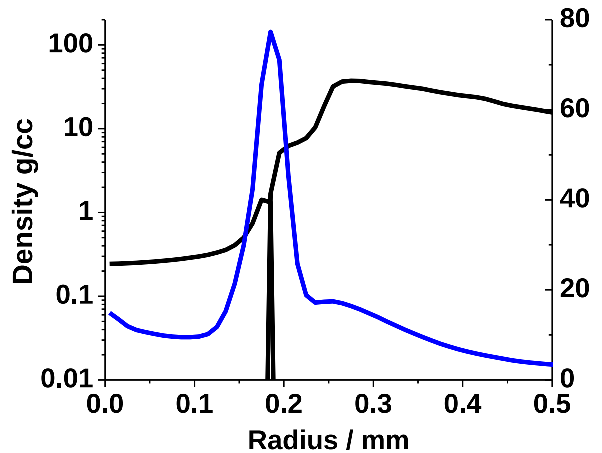
In this case the addition of nernst term resulted in ~50% reduction in yield

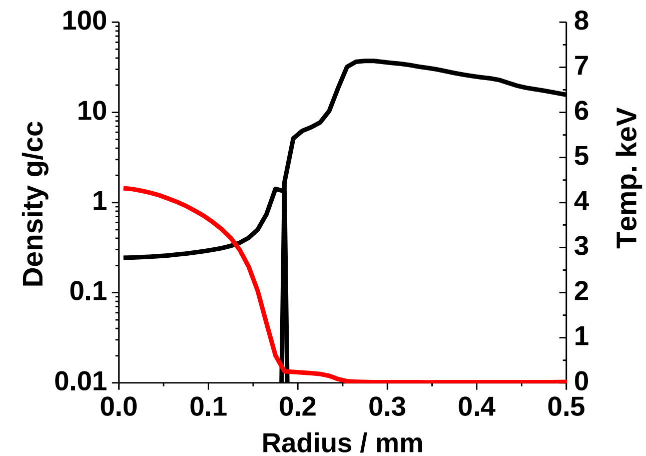
No Nernst





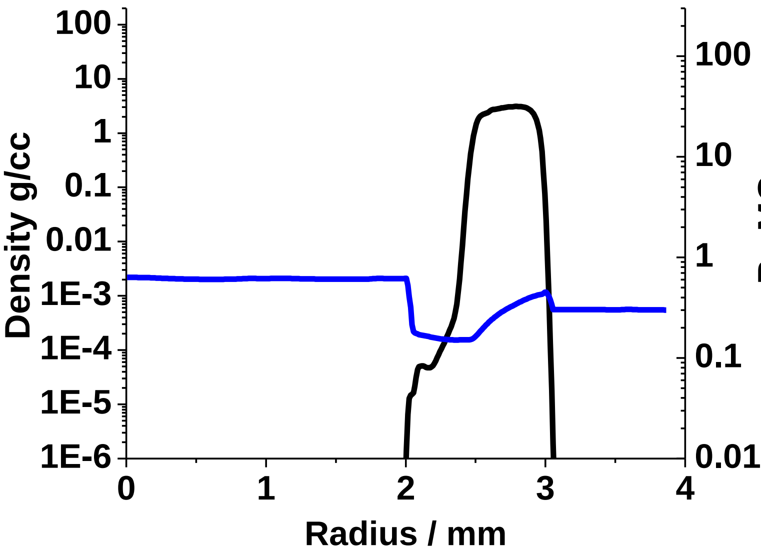
With Nernst



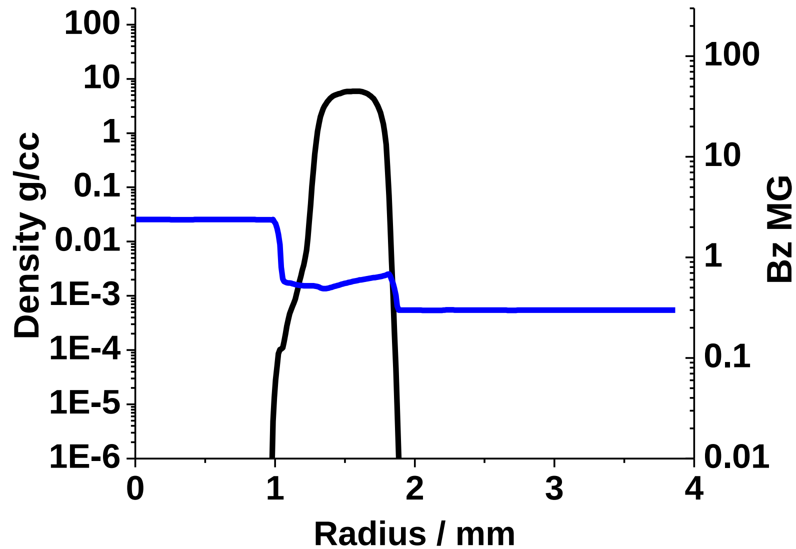


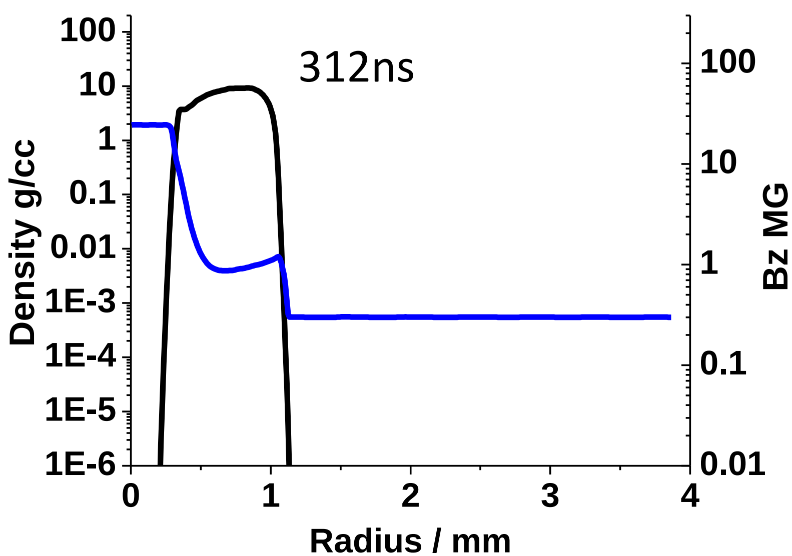
Compression of an initial 30T Bz field

270ns



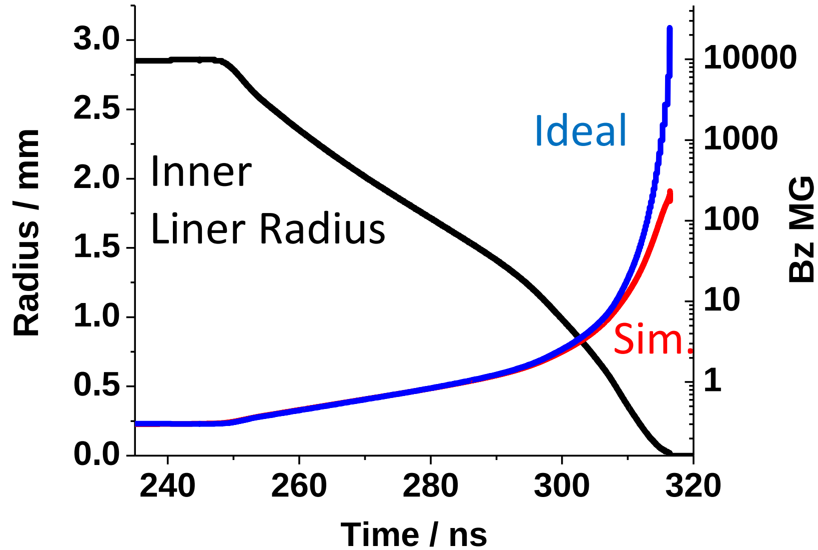
300ns

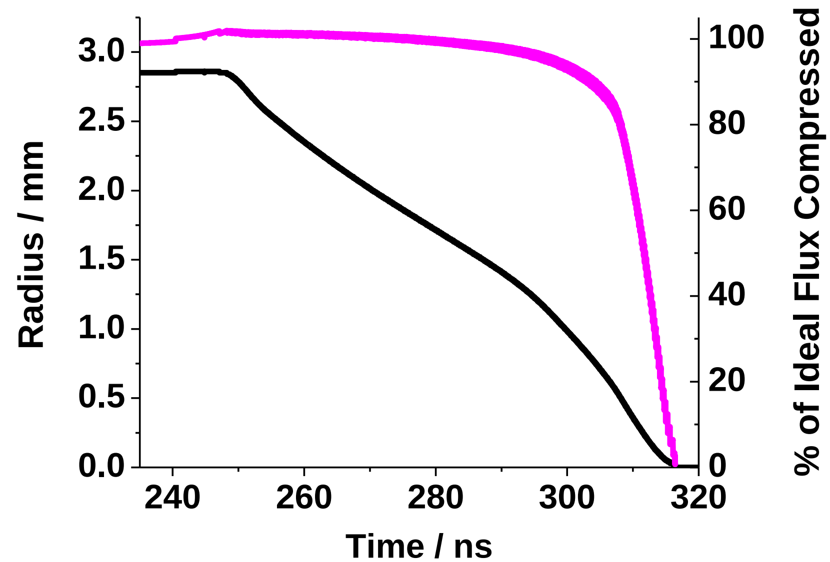




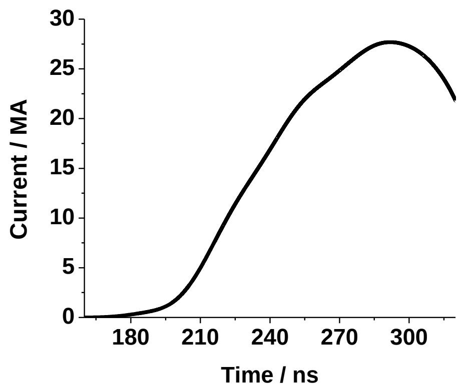
Flux Compressed by Imploding Liner vs. Ideal flux compression given the location of the inner liner/vacuum boundary

% of flux compressed / ideal flux compression

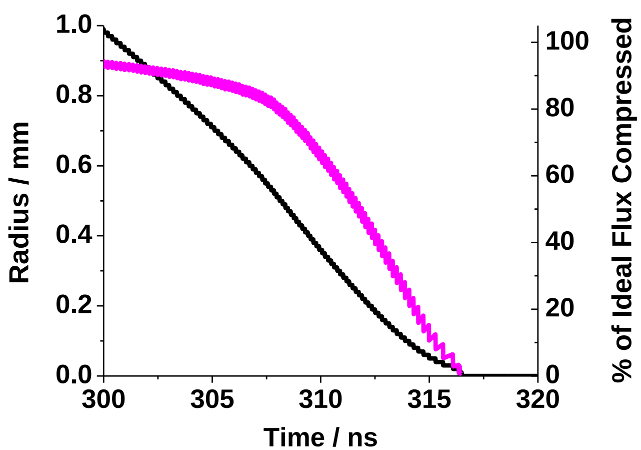




Calculations were run at a fixed 10 micron grid resolution, so expected error at very small radius



For reference, this is the current pulse used in calculations



Energy of Imploding Liner as a function of time (kinetic + internal) for case of liner compressing 2.5mg/cc fuel with a 10kJ laser preheat