Design of halfraums for x-ray flow experiments on the NIF

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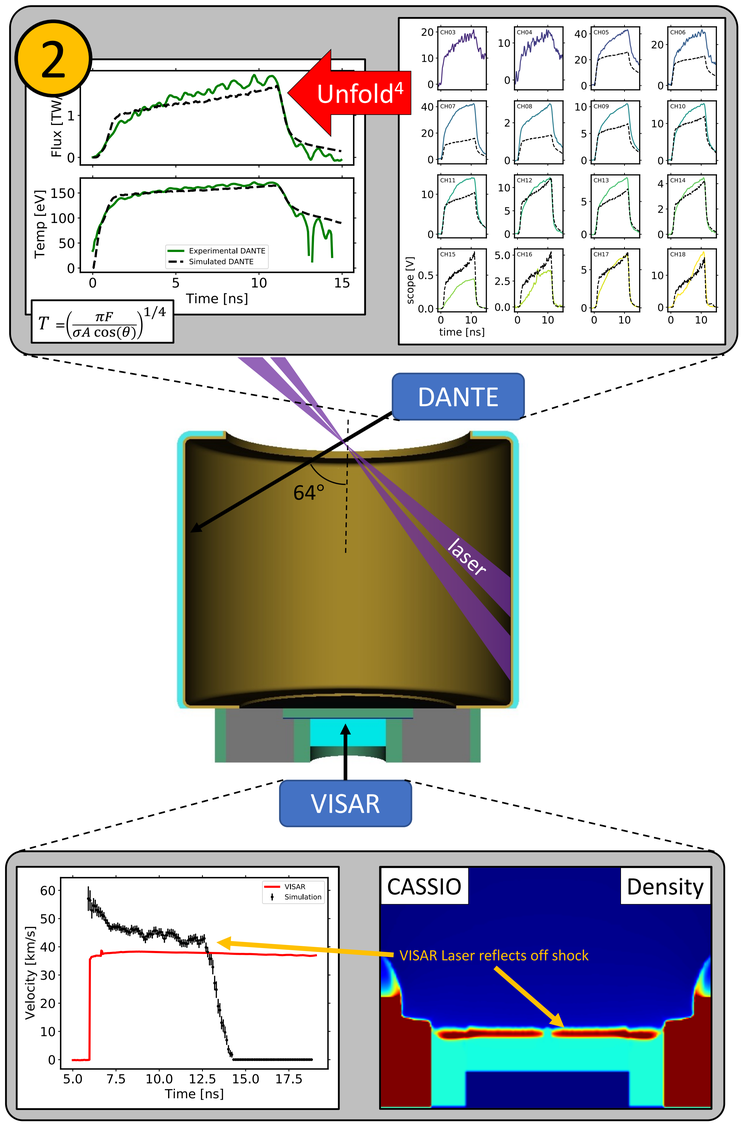
Halfraum Simulation in CASSIO

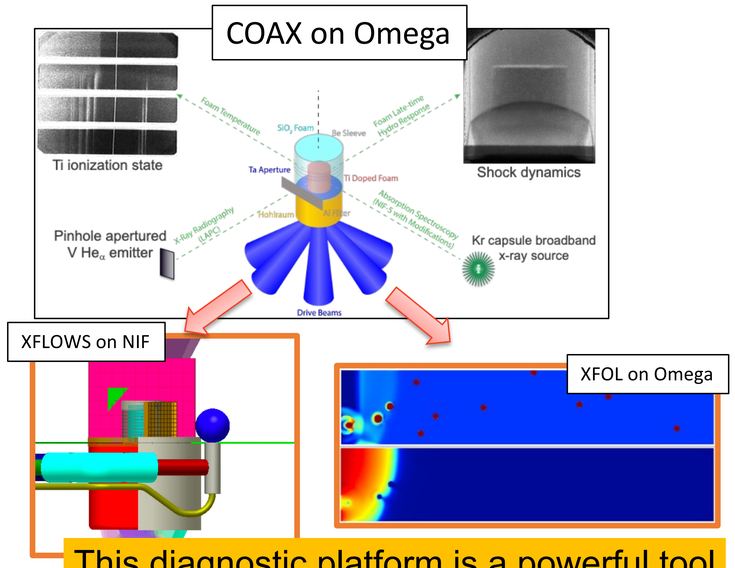
A multi-physics, Eulerian radiation hydrodynamics code

- Cartesian mesh with Adaptive Mesh Refinement (AMR).
- Laser ray tracing and deposition.
- 80-group Implicit Monte Carlo (IMC) x-ray transport.
- 3T, diffusive electron and ion conduction.

Vet model with drive data from NIF shot N200615



XFLOWS moves successful COAX campaign to NIF



This diagnostic platform is a powerful tool for the study of x-ray flow at different temperatures and in different materials.

Introduction

XFLOWS is an experimental platform that uses the power and capability of the NIF to study x-ray flow in a new way. Initially, the project with focus on observing supersonic x-ray flow in uniform foams and will study the supersonic to subsonic transition. In the future, we hope to study x-ray flow in exotic materials such as stochastic media.

Platform goals require a Planckian temperature source, with customizable temperature and duration.

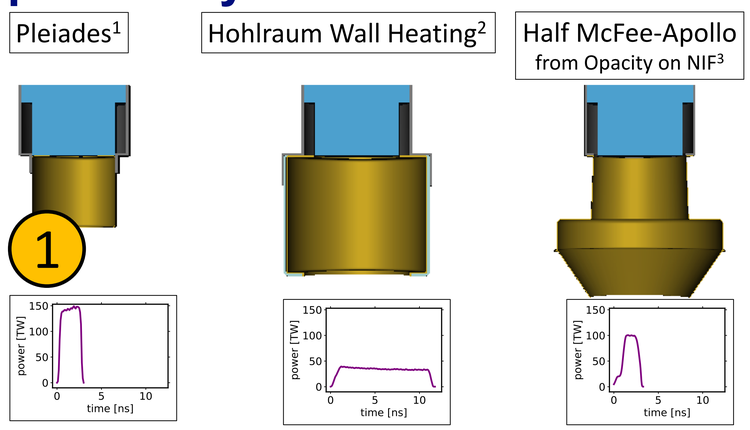
How to design a halfraum:

1. Start with something known.
2. Use data of known thing to validate computational model.
3. Apply computational model to new designs

References

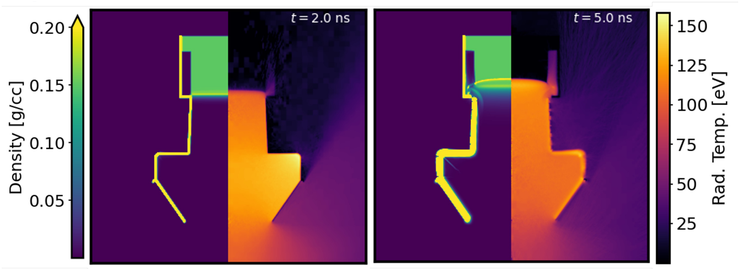
[1]Moore *et al.*, JQSRT, **159**, (2015); [2]LLNL Report, COPD-2022-0185; [3]Dodd et al., POP, **25**, 063301 (2018); [4]Barnak *et al.*, RSI, **91**, 073102 (2020)

Considering a suite of previously tested hohlraums



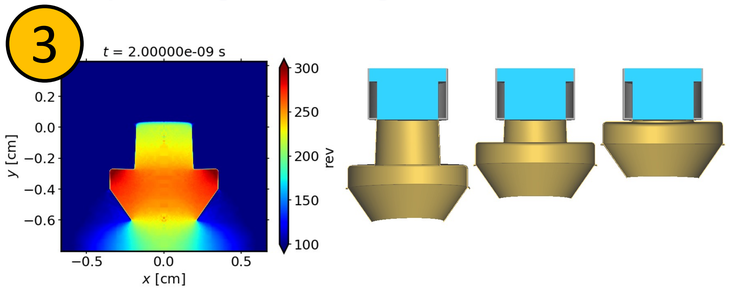
CASSIO models of halfraums driving XFLOWS foam

Half McFee-Apollo is promising; needs to be hotter for supersonic flow.



Hotter source needed to measure supersonic flow

Use temperature gradient along stalk to alter the drive



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