

Thermomechanical Shock Experiment Design for the National Ignition Facility

Haley Hilborn
New Mexico Tech
Mechanical Engineering

Sandia National Laboratories
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Manager: Fred Hartman
Mentor: Kate Bell
Org. 1343

Introduction

Experimentation studies impulse and thermomechanical shock response of materials in x-ray environments. The National Ignition Facility (NIF) at Lawrence Livermore National Laboratories (LLNL) utilizes intense lasers to generate laser-ionized plasma to emit warm x-rays. Experiments involve placing samples at specified distances to study material response.

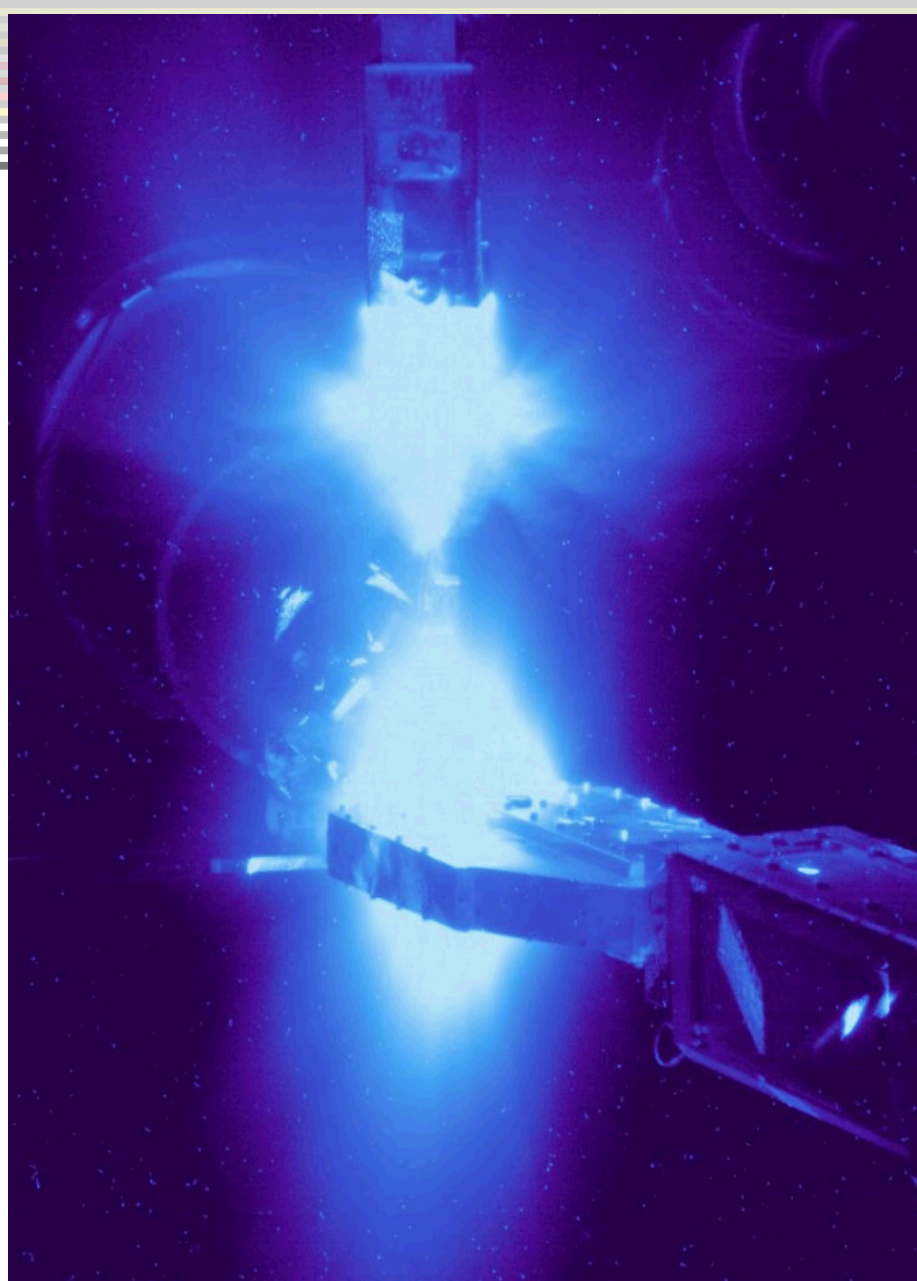


Figure 1.
750kJ Krypton Shot

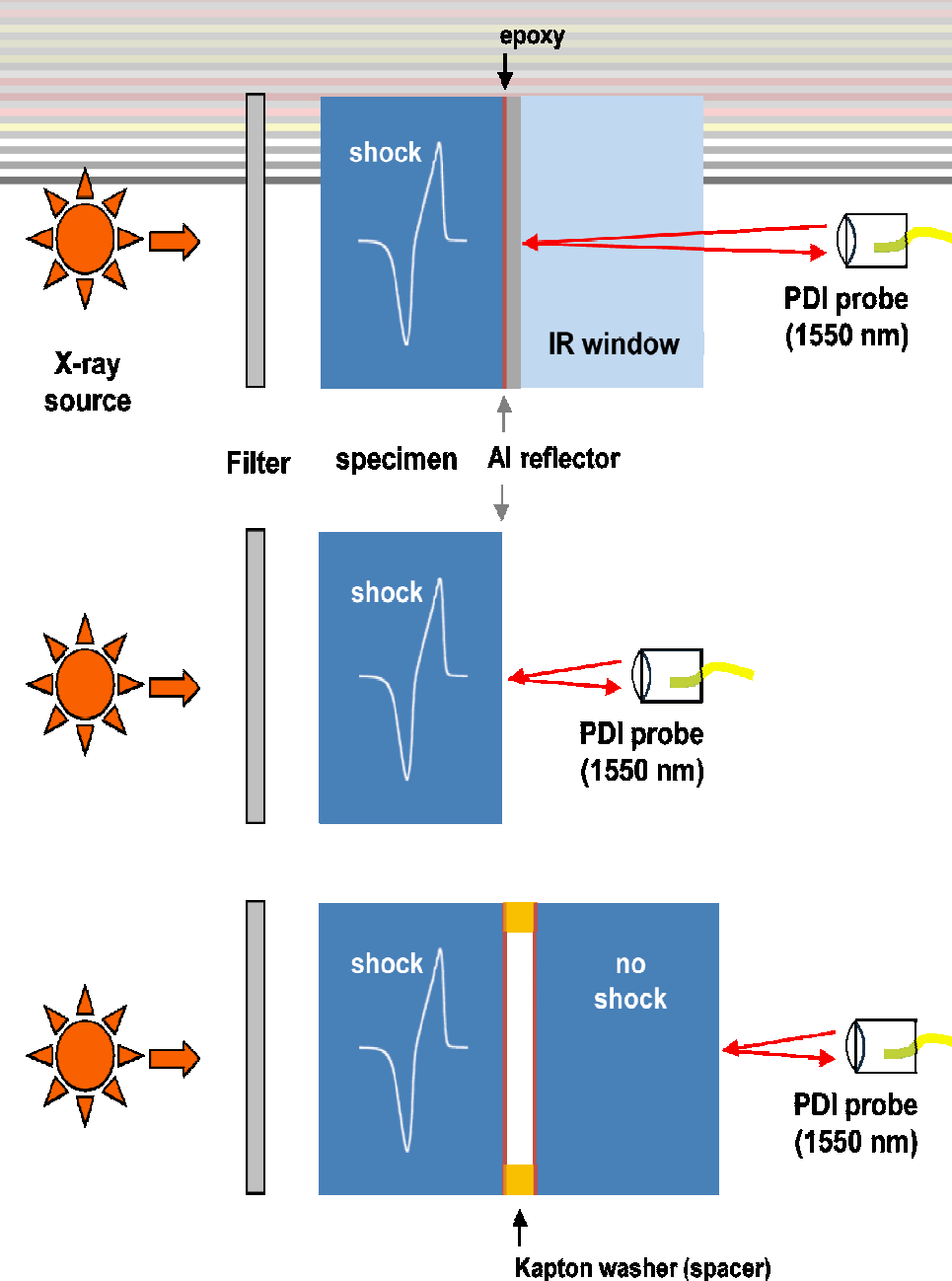


Figure 2.
Sample Shock Propagation

Design

- Cylindrical sample unit design
- Increased sample units in snout
- Ability to change sample unit distance from Target Chamber Center (TCC)

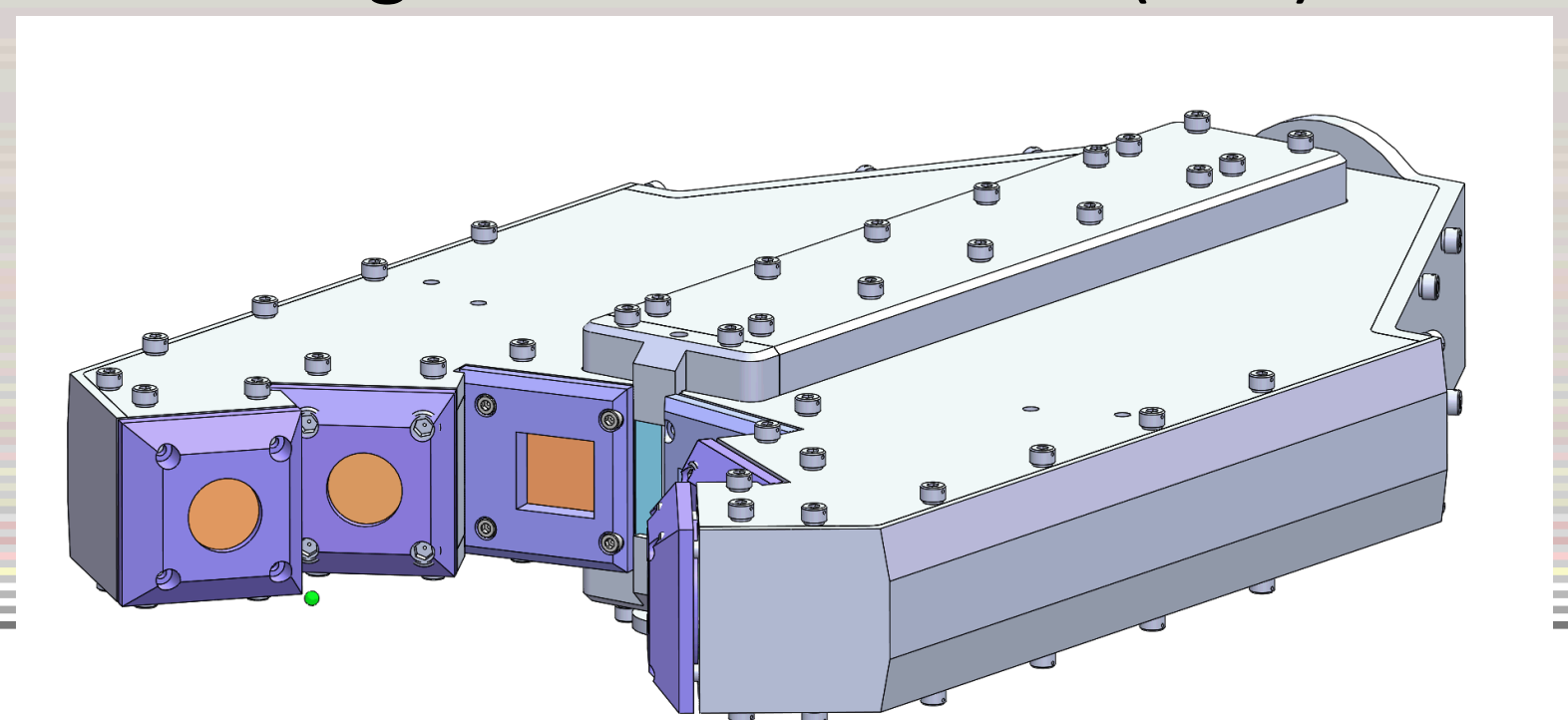


Figure 3. Previous Snout Design

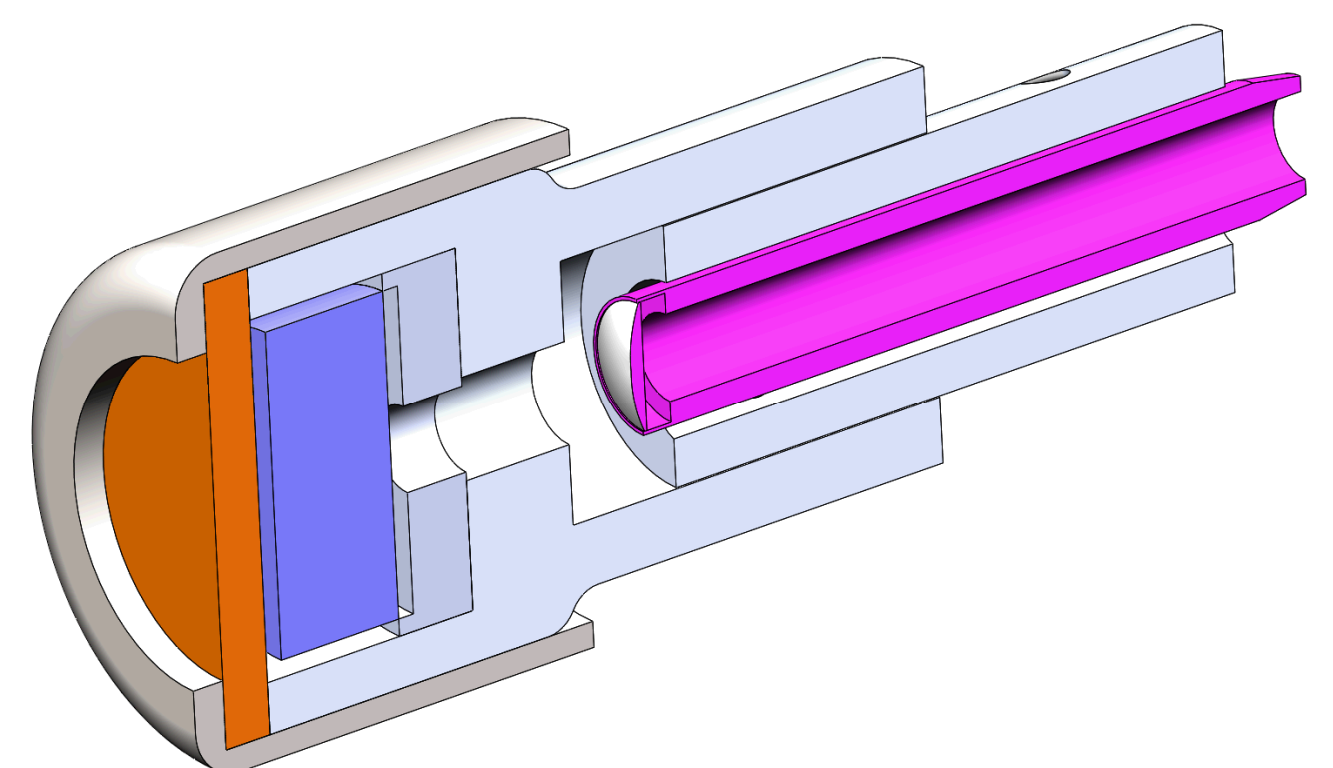


Figure 4. Redesigned Sample Unit
Cross-Section

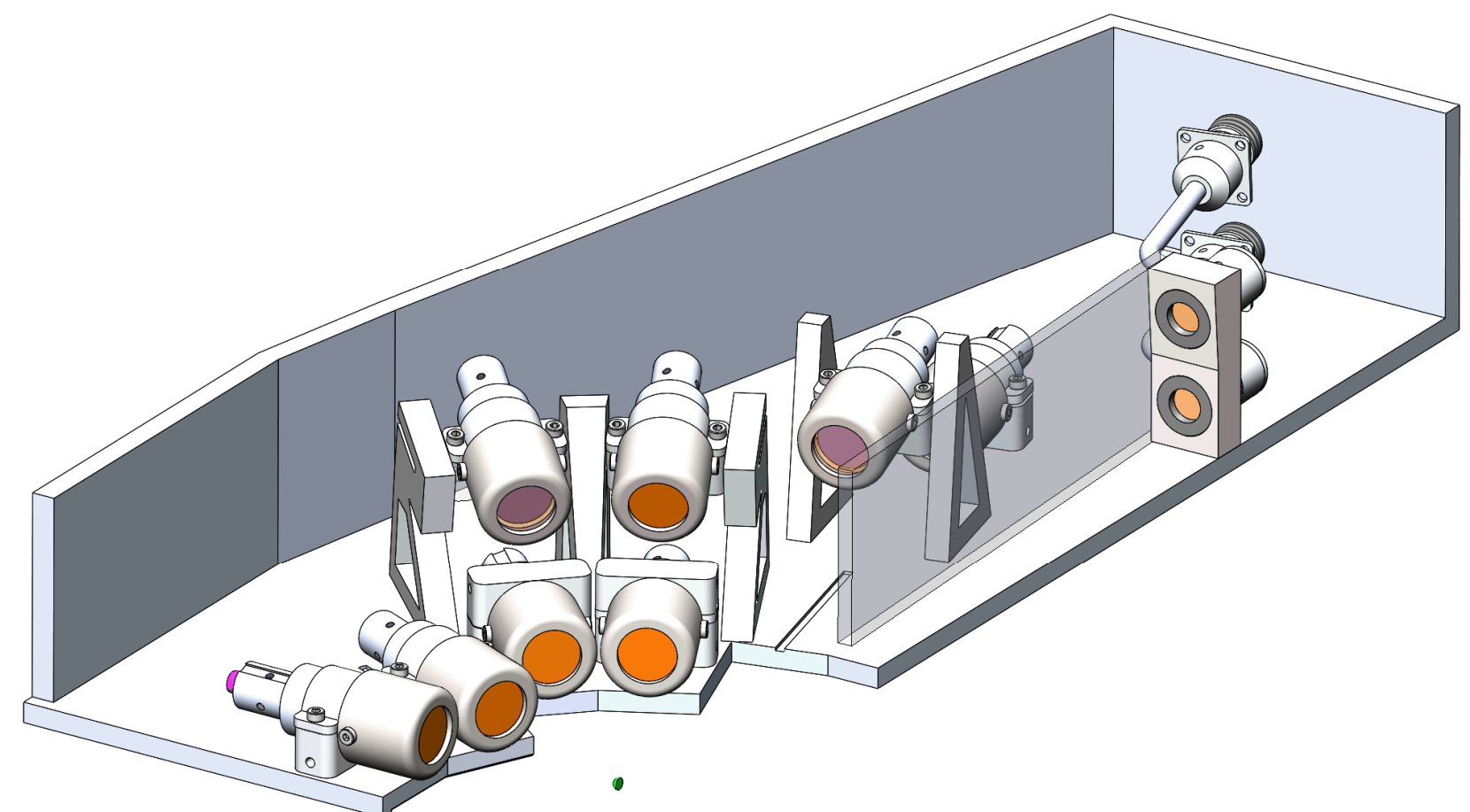


Figure 5. Modified Assembly Section View

Objective

A new, versatile experimental setup will be designed fulfilling the following requirements:

Sample & Experiment Parameters	
Sample O.D.	19mm
Sample Thickness	1-8mm
Sample Stand off Distance	7.5-30?cm
No. of Sample Units	Min. of 12
Filter Thickness	Max. of 3mm
No. of Calorimeters	4 at Min. 30cm offset

- Maximum gate valve Diameter: 425cm
- Metal Surfaces facing target must be SS 304
- Hardware must be 1cm away from all beams

Future Work

- Finite element model analysis
- Debris-Wind and Ablation analysis in conjunction with LLNL