

What's New for Users at the NIF...

NIF & JLF User Group Meeting 2024

January 30, 2024

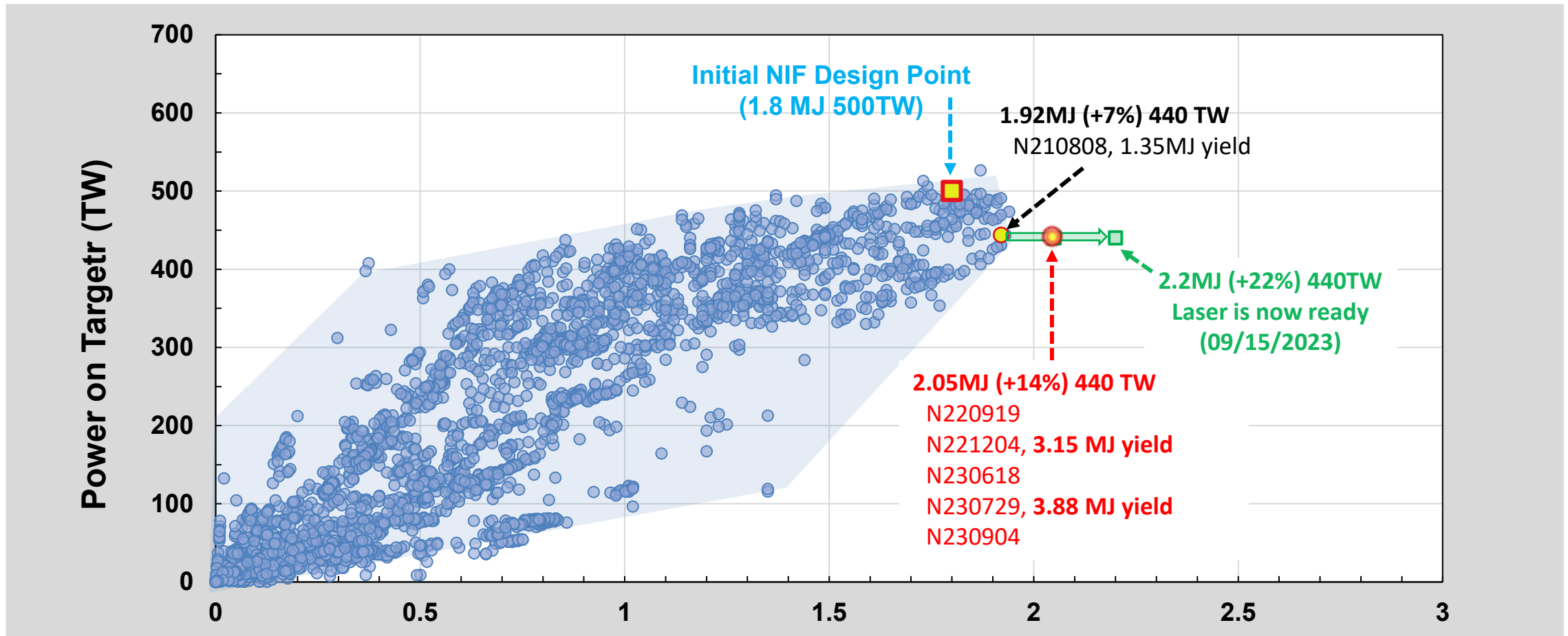
Kevin Fournier, *et al.*



Outline

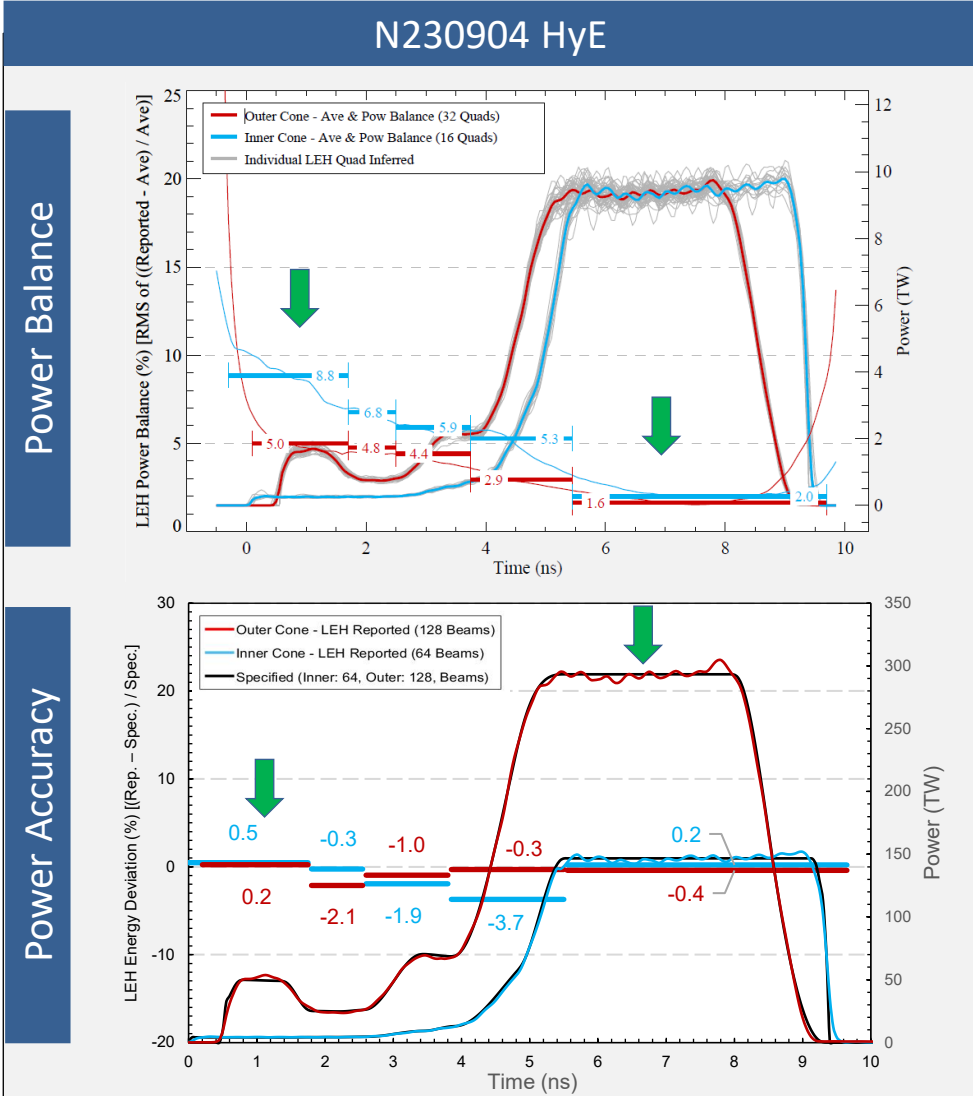
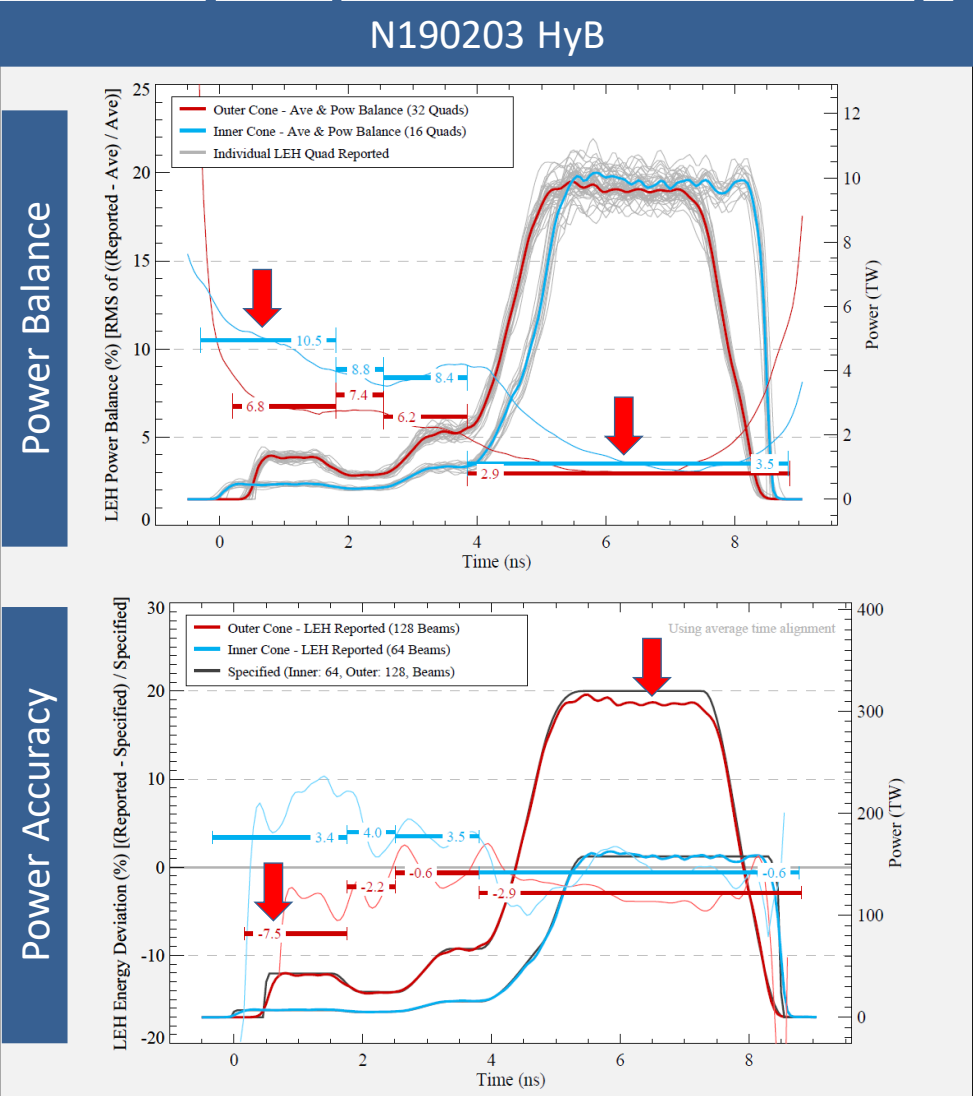
- Main laser performance improvements
- Scheduling high-yield experiments in FY25
- Changes in the Discovery Science Project Engineer support team
- Target Fab. and expectations for new campaigns
- RevEx functionality and uses in TaLIS Debris & Shrapnel reviews
- Optical Thomson Scattering and improved reliability of 3ω OTS
- DLI as a new capability

Reduction in optics damage initiation and improvements in optics reprocessing enabled sustainable shots at 2.05 MJ



Laser performance points of contact:
Jean-Michel Di Nicola (dinicola2), Michael Erickson (erickson33)

Over the last four years, the power balance and accuracy delivery has significantly improved thanks to upgrades and refurbishments

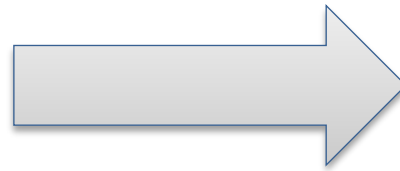


With limited statistics since June 2023, the picket RMS accuracy was improved by ~ 2x compared to FY18-19

Impact of ignition and increased yield on scheduling - Higher yields require a longer stay out time post shot

Schedule basis up to FY24

Yield Bin	Add Hours
Yield > 1E15	10
Yield 1e16<Y<=3E17	12
Yield 3e17<Y	18



Schedule basis starting in FY25

Yield Bin	Add Hours
Yield 1e16<=Y<2E16	10
Yield 2e16<=Y<4E17	12
Yield 4e17<=Y<2E18	16
Yield 2e18<=Y<4e18	35
Yield >=4e18	48

Scheduling points of contact:
 Derrick Lasse (lasse3), Megan Francisco (francisco6)

We are looking at options to minimize the impact of the expanded stay-out times

Changes in Discovery Science Project Engineer support



Discovery Science points of contact:

Bruce Remington (remington2), Dan Kalantar (kalantar1), Megan Francisco (francisco6)

Target Fabrication has reorganized to improve reliability of target delivery

- Target Fabrication has reorganized in FY23 to address issues with engineering rigor on ICF targets
 - The ignition target yield is expected to start improving in FY24
 - Benefits from process improvements will benefit other targets in the future
 - The reorganization will not affect how users interact with Target Fab
- Scope evaluation is being performed more stringently to ensure that we can deliver the targets to which we are committing
- Target Fabrication effort for DS has increased by 50% from FY22 to FY24; this increase is not sustainable
 - Going forward, DS campaigns should make use of existing target platforms as much as possible, and development of new platforms will be limited
 - Target Fab can provide assessment of target effort and risk

Use existing platforms with minimal deviations if possible



RevEx Update: TaLIS Debris and Shrapnel (D&S)

Experiment: H_Burn_Sym_PSS_SSS **Task:** Debris and Shrapnel Assessment

Annotation Task History Links Attachments Data Management

Go to TaLIS Report

Unapprove

Approved by campbell92 on Mon Jan 22 2024

Shot Energy Parameters

Approved by campbell92 on Mon Jan 22 2024

Shot Energy: 1578.2496699999997 Number of Beams: 192

ARC: DLI: Yield: 8.0E+15

Comments: Enter text here...

Unapprove

Debris and Shrapnel Review

Shot Goals Comments Actions Attachments Open SCRs

Goals

Report Criteria

Add Criteria

Primary	Comparison	Command
H_Burn_Sym_PSS_S12	H_Burn_Sym_PSS_S11	Edit Remove

Run Report

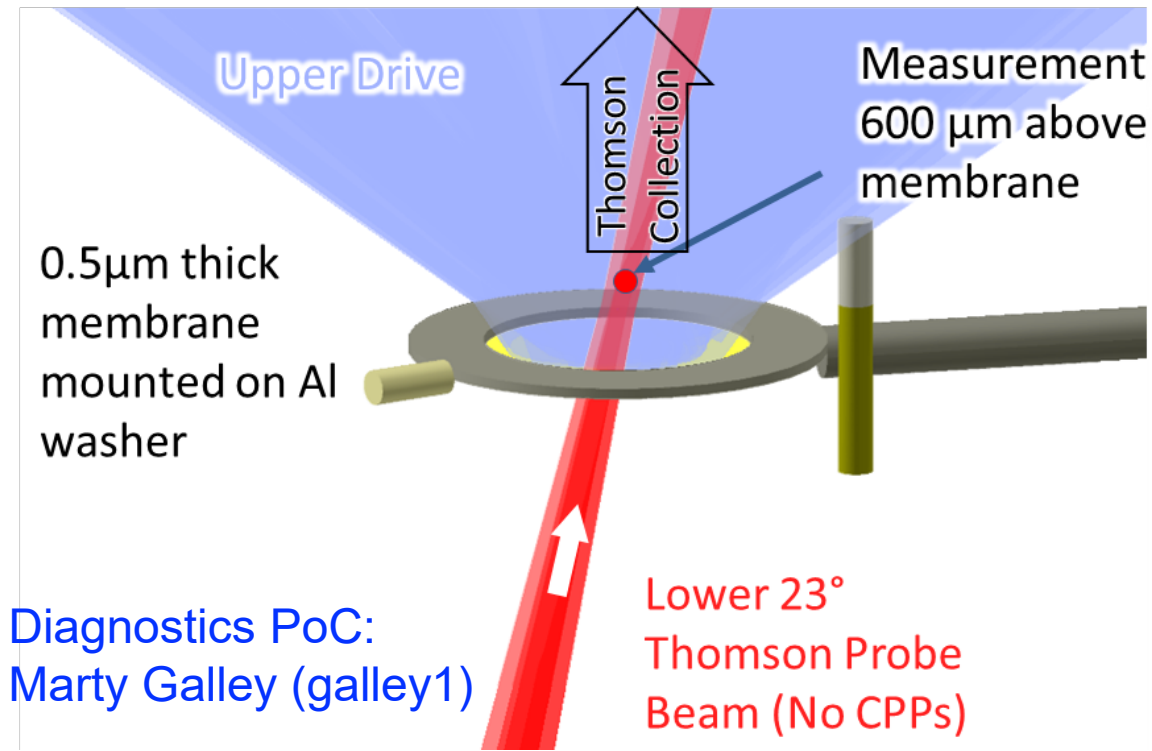
		H_Burn_Sym_PSS_S12	H_Burn_Sym_PSS_S11
Shot Energy			
Shot Energy		1578.25	1578.281
Number of Beams		192	192
ARC			
DLI			
Yield		8.0E+15	5.0E+15

- Moving the TaLIS Group assessments from Shot Planner
- Allows the utilization of the automatic data fill incorporated from the Setup Review portion recently added.
- More transparent approval process: piece by piece vs all or nothing
- Another tool to compare experiments (more in-depth information than Setup Review table)

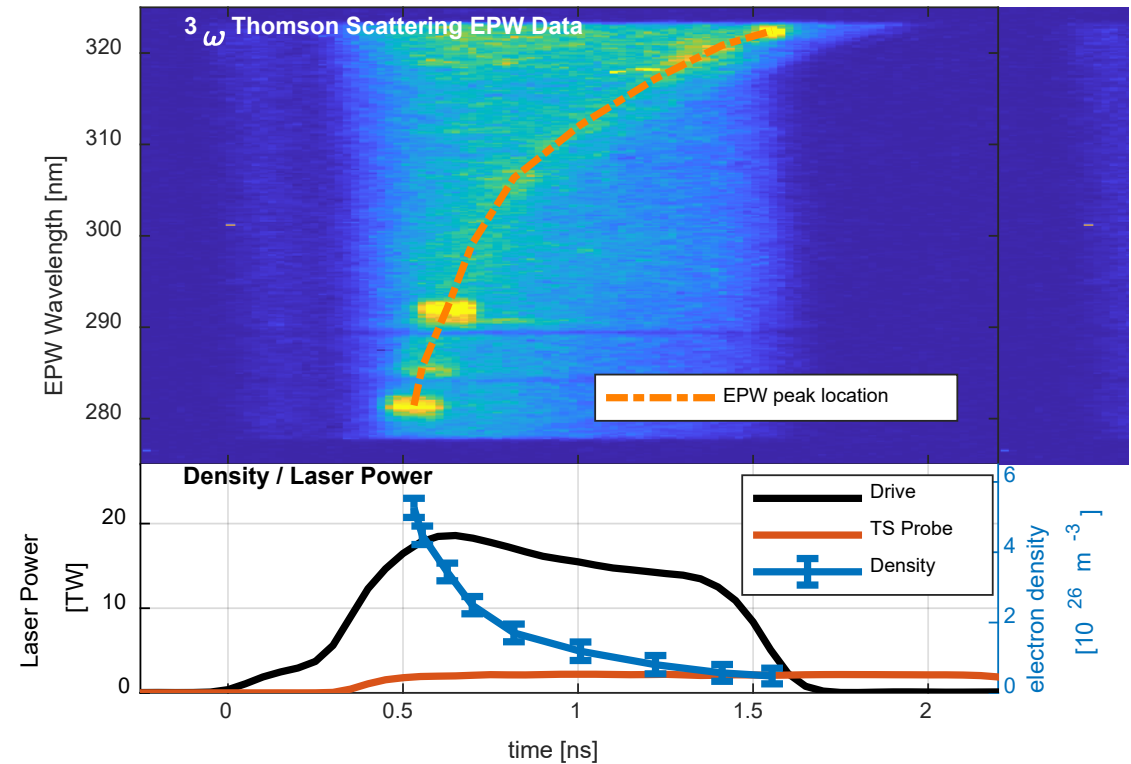
RevEx and review point of contact:
 Greg Campbell (campbell92),
 TaLIS PoC: Dean Latray (latray1)

The first 3ω OTS measurements made in a NIF LEH plasma earlier this year

Following pausing of 5ω Thomson scattering development, work is currently underway to attempt 3ω Thomson scattering measurements in hohlraum relevant conditions. In November we made the first density measurement in a NIF LEH plasma using 3ω TS



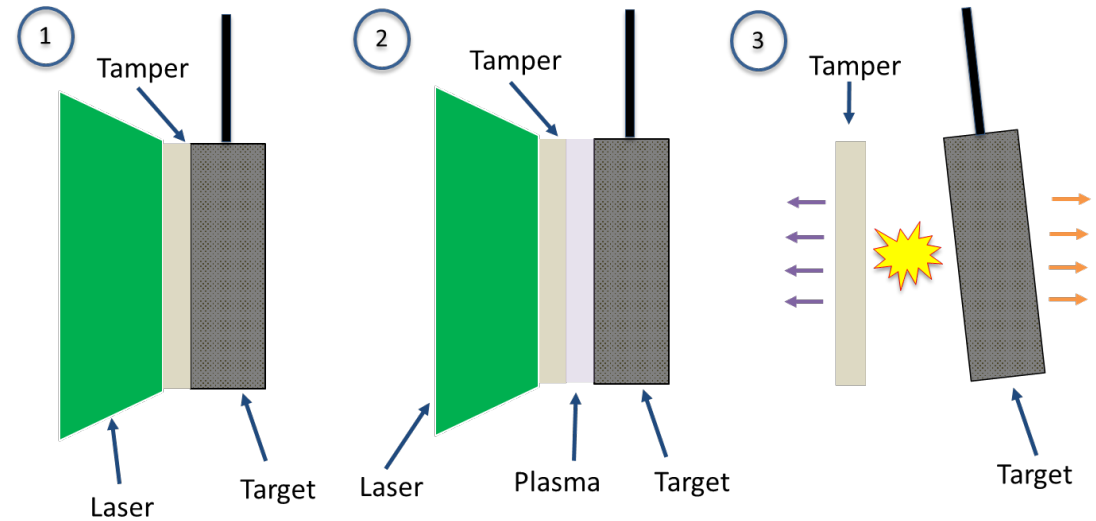
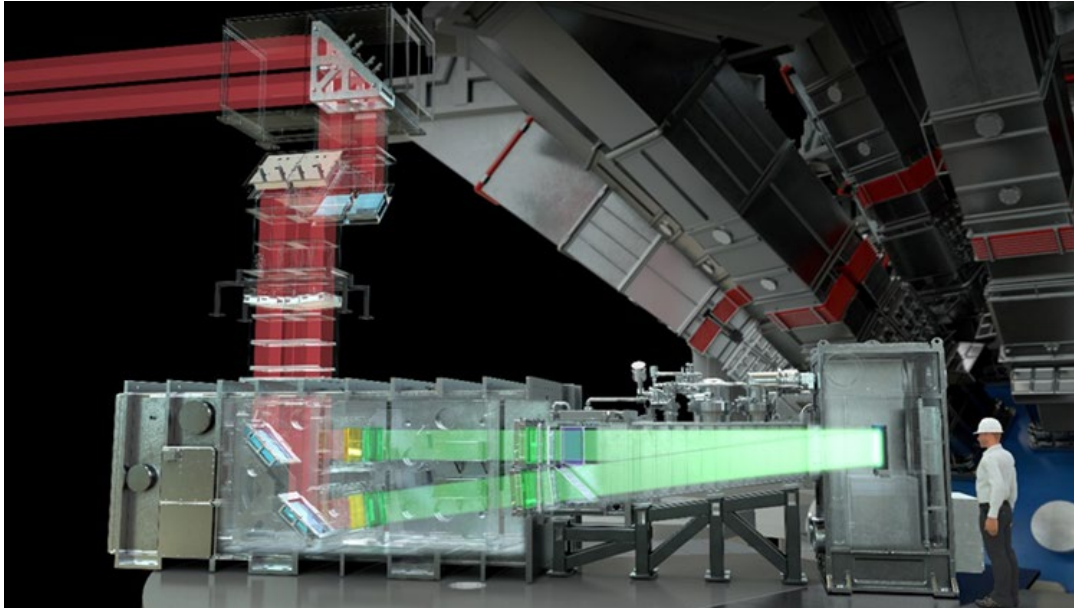
Diagnostics PoC:
Marty Galley (galley1)



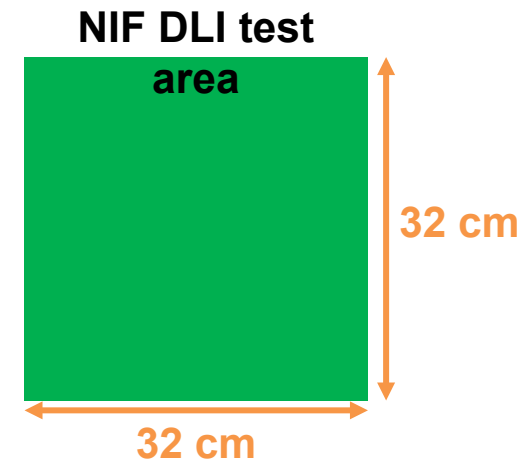
3ω EPW and IAW Thomson Scattering is a fully commissioned diagnostic. Reliability issues associated with the diagnostic a few years ago have been fully resolved and the OTS DLP has performed correctly in all experiments in the last FY

NIF Direct Laser Impulse

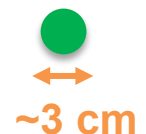
DLI Points of Contact: Brent Blue (blue3), Klaus Widmann (widmann1), Kyle Carpenter (carpenter46)



- NIF DLI is a newly commissioned experimental platform for studying the effects of blowoff induced impulses
- 2 NIF beams are redirected into a separate target vessel where they directly illuminate the surface of a test object
 - The direct laser illumination launches an impulse into the target that is similar those generated by x-ray induced blowoff
- The increased exposure area (1000 cm²) enables the testing of large, 3d objects



Representative sample for NIF x-ray tests



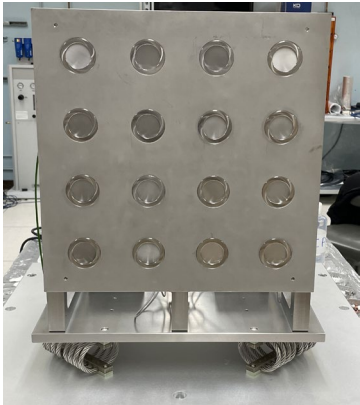


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Progress and current status

We expanded our testing capabilities with new targets and diagnostics

Coupon array target



Photonic Doppler Velocimetry (PDV) system

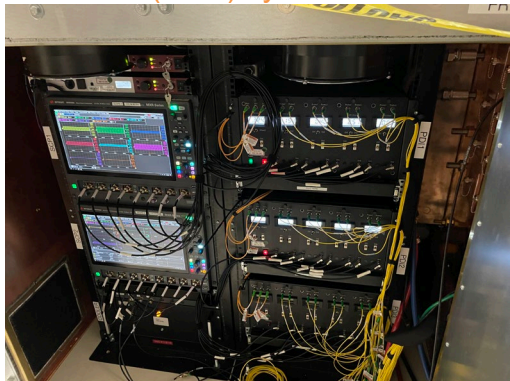
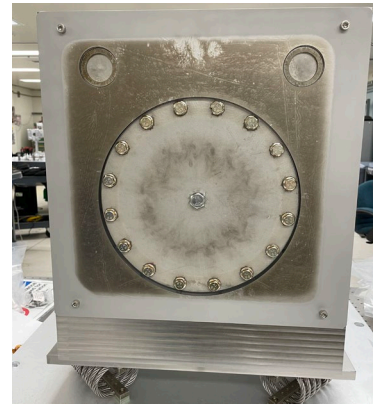
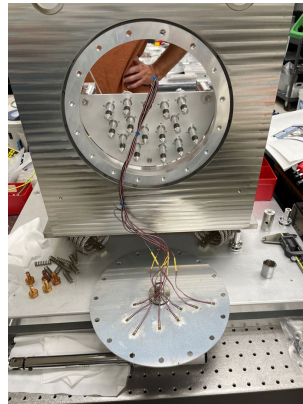
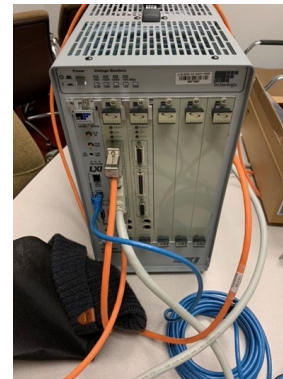


Plate deformation test for AWE



Data acquisition system for structural response measurements

Cylinder target – 1st non-planar target on NIF DLI



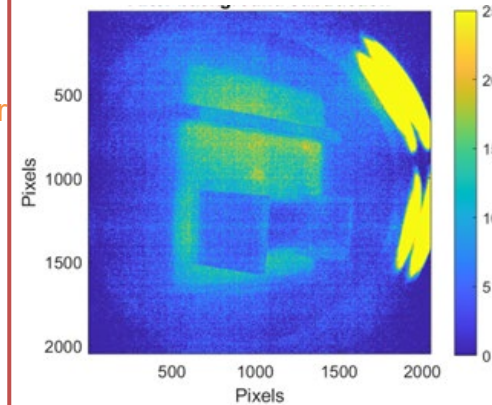
Current laser parameters

- Up to 12 kJ (6 kJ/beam)
- 1000 cm² illumination area

Diagnostic capabilities

- 24-channel PDV system for high-speed measurements
- 16-channel DAQ for longer-time measurements

Target viewing system image from recent experiment



The DLI commissioning team, led by Tiziana Bond, continues to make substantial progress developing the NIF DLI system:

- Target viewing system
- Backscatter diagnostic
- Investigation/Assessment of system performance for new laser pulses or target types