NIF User Office – what's new since the last User Group meeting

Presented to the NIF/JLF User Group meeting

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Outline

- User Office Staff and Mission
- Response to 2016 User Group recommendations
- Updates to user experience: training, process, and software tools
- New Facility Capabilities
- Web-based documentation and resources



Kim Hallock has transitioned to a new job in the lab looking for fresh challenges...



Thanks to Kim for all she's done to stand up and support the User Office!



User Office Staff and key user support personnel



The User Office is here to help with experimental design, experimental reviews, shot set-up software and data archive and visualization software, and schedule optimization



User Office Staff



The User Office is here to help with experimental proposal workflow, LLNL and NIF site access, NIF shot RI training, shot review tracking, and administrative support



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Actions in response to the recommendations from the 2016 User Group meeting (proposals)

- Encourage proposals with academic PIs and from new teams (Bruce Remington *et al.* have been enthusiastically spreading the word)
- Make clear what platforms and diagnostics will be available
 - Designate a single person at LLNL who would be responsible for having accurate information on availability of platforms and diagnostics of interest to teams who are proposing (Kevin Fournier in this iteration)
 - Require single POC for each proposing team to check with this person and transmit accurate information to proposing team
- (All communications to the PI of record, cc to liaison)
 Require LOIs with enough information to enable feedback

(Done, helpful for the final proposal and to screen initial submissions)

Give feedback to proposing teams in response to their LOIs (as was the case in the 2014 award process) (Feedback from Dan Kalantar, Gayatri Gururangan, Kevin Fournier, Bob Ehrlich)

Text verbatim from Don Lamb's 2016 slide





Actions in response to the recommendations from the 2016 User Group meeting (scheduling)

- Academic teams do not have the resources to begin final experiment design until they have approved shot days; time for this should be built into the cycle. (Done, experiments to start 12 to 15 months after award)
- Time needed for final experimental design is at least 6-9 months for new/novel experiments that are not closely related to programmatic experiments, and may be for those that are; time needed for follow-on experiments can be shorter. (Done, readiness is actively tracked and dates adjusted; Rich Zacharias, Kalantar, Target Fab, Bob Burr)
 Shot days need to be no more frequent than every six months to allow changes in the experimental design. (Done, implemented by Zacharias, Kalantar, Burr and the scheduling committee)
 While follow-on proposals may or may not succeed, the award
- while follow-on proposals may or may not succeed, the award process should expect them and be designed so the follow-on experiments go smoothly. (Done)

Text verbatim from Don Lamb's 2016 slide





The recommendations for new NIF platforms and diagnostics for DS from the 2016 meeting

- Platforms:
 - ARC (See following charts, Dave Martinez's talk)
 - MIFEDS (under study in our Target Diagnostics organization)
- Diagnostics:
 - Proton radiography (Done)
 - X-ray (Many new capabilities, see following charts)
 - Gamma-ray (New GCD brought online, see following)
 - TS diagnostic employing 3ω light, and eventually, 4ω and 5ω light (in progress, following charts, Steve Ross's talk)

Text verbatim from Don Lamb's 2016 slide



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The proposal process for NIF time has been formalized based on User feedback



See the poster <u>Proposing and</u> <u>Planning Experiments at the</u> <u>NIF</u> by Essex Bond in Wednesday's poster session



New PIs awarded facility time will take advantage of updates to streamline Shot RI Training

- Created a Single Point of Contact: NIF User Office (NUO), coordinated by Mat Snyder
- A new introductory online training module is now offered: NP1313-W
 - Replaces two face-to-face training modules (Introduction and User Office)
 - Available as an introduction to PIs and campaign RIs who do not wish to complete full shot RI training
 - Some topics covered are:
 - NIF configuration and capabilities
 - Roles and responsibilities
 - Experimental lifecycle
 - Expert groups and facility stakeholders
- Request form is now available via the web: <u>https://lasers2.llnl.gov/forms/shot_ri_training.php</u>





New PIs awarded facility time will take advantage of updates to streamline Shot RI Training

NIF User Office

Privacy & Legal Notice

National Ignition Facility (NIF) Shot Responsible Individual (RI) Training NP1313-W

Start Course .

NIF

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The shot planning process has been refined



- Checklist for review/assessment gates and shot RI responsibilities – version 1.0, stay tuned
- Pre-reviews of all scheduled shots
- Target requests and design reviews
- Where to go for help

See the poster <u>Proposing and</u> <u>Planning Experiments at the</u> <u>NIF</u> by Essex Bond in Wednesday's poster session

Process development led by Essex Bond POCs: Rich Zacharias, Dan Kalantar, Gayatri Gururangan

Project Engineers and User Office staff are here to help!



Engaging the DS experimental teams earlier in the planning phase has resulted in improved shot readiness



- At T-6 months, a set of slides containing high-level information about the experiment configuration are requested for all new DS experiments.
 - The submitted information fosters communication between facility and the experimental team and allows the facility to plan follow-on work.
- A T-3 months, for *new* platforms, we have a target design review
- We have also instituted a bi-weekly meeting dedicated to tracking and discussing open issues for DS experiments.
 - This is very important between T-6 and T-3 months where consensus needs to be reached on requirements for new capability, e.g. unique target gas fill.



New tools are have been developed in the last year to help with requesting and setting up shots



- Internal link to NIF applications: <u>https://nifit.llnl.gov</u>
- Specific link to the <u>new</u> shot setup tool, i.e., SST: <u>https://nifit.llnl.gov/sst/</u> See the poster <u>Sh</u>

See the poster <u>Shot Set up Tool Plans</u> <u>and Status</u> by Doug Speck and Allan Casey in Wednesday's poster session





Data Systems - Transition Strategy Between CMT (old) and SST (new) shot set up tools

- Run both editors in parallel during transition (most of 2017)
- Through periodic releases, migrate data groups from old to new editor
 - Start simple a few stand-alone TD systems in initial releases (i.e., not the laser, not the DIMs)
 - Receive user feedback at earliest stages of implementation
- A data group will be editable in only one editor at a time
 - Users will have access to a unified view of entire experiment from either editor



Ability to setup EXHI and FFLEX diagnostics in Shot Setup Tool formally released in January

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TANDM and DIM support planned for Spring / Summer 2017 Diagnostics and Common Data Model support Summer / Fall 2017



Ability to setup EXHI and FFLEX diagnostics in Shot Setup Tool formally released in January



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Ability to setup EXHI and FFLEX diagnostics in Shot Setup Tool formally released in January

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TANDM and DIM support planned for Spring / Summer 2017 Diagnostics and Common Data Model support Summer / Fall 2017



Significant performance updates have been made to User Tools

- Industry uses 2 seconds for a page load as a benchmark
- Approval Manger pages load in under 1.2 seconds on average
 Over 10 times faster than this time last year
- Archive Viewer pages load in under 1 second on average
 About 5 times faster than this time last year
- Shot Planner experiment and calendar pages load in under 2 s
- Eliminated slow downs in drop down menus in Shot Request tool when multiple experiments are open
- Web based setup reports load about 10 times faster
 Compared with this time last year

Monitoring is in place to continue to ensure performance level are maintained



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- New Facility Capabilities
 - Laser
 - Target Area (diagnostics, positioners, etc.)
- Web-based documentation and resources





Main laser performance and ARC commissioning have received emphasis this year

- The facility is dedicating more time to laser-system shots to confirm and update model performance
 - The 1ω part of the model was verified in the summer of 2016 and the model updated
 - The 3ω part of the model was updated in December, and performance is being actively tracked
 - We are continuing to find the necessary balance between facility operations and user experiments to maintain the facility's optimum performance
- An Integrated Experiments Team (IET) was stood up to commission ARC at 30 ps for program shots
 - Laser performance issues with respect to contrast before the main pulse were addressed by laser scientists on the ARC diagnostic table
 - Target design issues for ARC microwire x-ray sources were addressed by HED physicists and target fabricators
 - Integration issues between ARC and main-laser beams were addressed by a systems approach in the chamber, addressing debris, unconverted light and alignment tolerances

Capabilities continue to be developed according to programmatic priorities, benefiting all users



ARC is a kilojoule-class laser delivering high intensity short pulses to target



A total of 16 ARC compressor gratings are used for the 4 beamlets



See Dave Martinez's talk on Wednesday

Pointing accuracy, energy, and bandwidth have been characterized, pre-pulse has been suppressed, and beamlets are co-timed with approximately 10 ps jitter



The ARC system has been optimized over the last 12 months by an Integrated Experiments Team



Credit to Dan Kalantar, Mark Hermann, Dave Martinez, Riccardo Tommasini, Warren Hsing and many others

Suppression of regen leakage and improved contrast between the prepulse and main pulse has led to a factor-of-two gain in x-ray flux from ARC-driven backlighters



The radiograph from a NIF experiment shot in December 2016 incorporated all that was learned as part of the platform development for an HED program campaign



See Dave Martinez's talk on Wednesday

Issues with unconverted light from the main drive, blow-by from the ARC beams, plasma formation from pre-pulse, alignment, and many other challenges were all addressed by the IET



New capabilities with target diagnostics, target positioners, alignment, and more

- TANDM Multifunction positioner capable for targets (FY16) or (limited, passive) diagnostics (FY17)
- ATLAS laser-based alignment aid
- Fiber delay backlighter made "pushbutton" but still requires early engagement with laser-system managers for fibers not currently in inventory
 - Implementing a new window strategy that will do away with fiber swaps. Available in mid-to-late spring.
- X-ray imaging
 - G-LEH gated laser entrance hole imager
 - AXIS detector for Compton radiography using the ARC laser
 - KB Optics A high-magnification, narrow band x-ray imaging system
- X-ray spectrometers
 - Virgil soft x-ray spectrometer along DANTE line of sight
 - NSS survey spectrometer from ~ 10 keV to ~ 200 keV
 - Optical Thomson Scattering system currently being commissioned for 3ω , will operate at 5ω
 - OpSpec soft-x-ray imaging spectrometer for opacity experiments
- Gamma-ray detection system
- Neutron imager line of sight, time-of-flight spectrometer, total dose and activation diagnostics
- Charged particle detection NEPPS

Capabilities continue to be developed according to programmatic priorities, benefiting all users



Multifunction Positioner - TANDM fields warm targets or existing diagnostics



Warm target fielding, including gas-filled targets, has been fully commissioned



TANDM alignment accuracy and stability have been characterized



Three active target positioners is key to increasing shot opportunities





ATLAS provides flexibility for positioner-based diagnostic alignment without an opposed port telescope







RCART – *in situ* flexibility for 0 or 90° rotation of GXD or DISC allows for more planned shot opportunities





All diagnostics have restrictions on their use based on how they have been designed

If you want to make modifications to how a system is run, start \gtrsim 18 months early with the facility to arrange and assess your request



AXIS (ARC X-ray Imaging System) - record temporally resolved, two-dimensional Compton Radiographs of ICF implosions using the ARC laser system





Virgil soft x-ray spectrometer installed on Dante center port



Design RI James Weaver, NRL Implementation Marilyn Schneider, LLNL





Virgil data for L-shell x-ray sources shows fantastic spectral resolution





OTS (Optical Thomson Scattering) – a DIM based diagnostic looking in the deep UV to understand plasma conditions







OTS was used to measure the UV background in an HDC Subscale hohlraum



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OPSPEC (Opacity Spectrometer) - a user-supplied snout, and is not yet a facility instrument





GCD (Gas Cherenkov Detector) – Gamma-Ray detector has 2x more sensitivity over GRH diagnostic



LANL designed and fabricated a 3.9 m "WellDIM" that will insert a Gas Cherenkov Detector close to the center of the NIF target chamber in a shielded environment.







nTOF North Pole is installed and taking data; the North Pole NIS snout is available to run on shots







NED (Neutron Effects Diagnostic) and the LASR (Large Area Solid Radiochemstry) collector are user-provided diagnostic packages



NED positions test components at 50 cm from TCC and provides active read-out LASR collects activated materials on a large foil





NEPPS (NIF Electron Positron Proton Spectrometer) – DIMmounted spectrometer that provides time-integrated energy spectrum of fast electrons, positrons and protons





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New resources for Users

- Web repository of NIF technical data <u>https://lasers.llnl.gov/for-users/shot-ri-resources</u>
- NIF User Fora cover salient or interesting topics monthly
 - The charts presented are available
 https://lasers.llnl.gov/for-users/shot-ri-resources/forum-archive
- NIF User Guide has been re-written in 2016, significantly updated from the 2012 version
 - Available online as a hyperlinked document
 - https://nifuserguide.llnl.gov/ (summer-student project for Alex Cupps)
 - Available as downloadable PDF

https://lasers.llnl.gov/content/assets/docs/for-users/2016-user-guide.pdf

Contact us at nifuseroffice@llnl.gov at or 925 422-2179





























https://lasers.llnl.gov/for-users/shot-ri-resources





The *updated* NIF User Guide is now online as a hyperlinked document

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1-1		View Edit Outline
	Contents 1. National Ignition Facility Overview 2. Governance, Roles and Metrics 3. Experimental Design and Execution	NIF&PS National Ignition Facility User Guide 2016
11-1	4. Laser System 5. Target Area	
	6. Target Diagnostics 7. Targets	
	 8. Data Handling 9. Facility and Safety 	



Summary: there have been updates to all aspects of the user experience

- A refined shot lifecycle process
 - Checklist for review/assessment gates and shot RI responsibilities
 Pre-reviews of all scheduled shots

 - Target requests and design reviews
 - Where to go for help
- A new introductory module for shot RI training
- New shot set-up tools
 - CMT to SST transition
 - Data systems performance upgrades
- New laser capabilities
 - Updated laser-performance modeling
 - Fiber Delay set up and requests commissioned up to 100 ns of delay
 - ARC current and near-term future capabilities
- New facility capabilities and new target diagnostics
 - TANDM positioner , ATLAS alignment, RCART
 - X-ray imagers, x-ray spectrometers, Thomson scattering, gamma detectors, neutronics
- New web-based resources for users



Summary: there have been updates to all aspects of the user experience

- A refined shot lifecycle process
 - Checklist for review/assessment gates and shot RI responsibilities (September User Forum)
 - Pre-reviews of all scheduled shots (January 2016 User Forum)
 - Target requests and design reviews (January 2016 User Forum)
 - Where to go for help (BLIP April 2016, NOL June 2016, Hazards March 2016 User Fora)
- A new introductory module for shot RI training
- New shot set-up tools
 - CMT to SST transition (March 2016, November 2016 User Fora)
 - Data systems performance upgrades (August 2016 User Forum)
- New laser capabilities
 - Updated laser-performance modeling (June 2016, December 2016 User Fora)
 - Fiber Delay set up and requests commissioned up to 100 ns of delay
 - ARC current and near-term future capabilities
- New facility capabilities and new target diagnostics
 - TANDM positioner (May 2016, October 2016 User Fora), ATLAS alignment, RCART
 - X-ray imagers, x-ray spectrometers, Thomson scattering, gamma detectors, neutronics
- New web-based resources for users (December 2016 User Forum)



