

**University of Rochester
Laboratory for Laser Energetics**

**National Laser Users' Facility (NLUF) Call for Proposal
For Experiments at the Omega Laser Facility
Fiscal Years (FY) 2024 to FY2025**

Original Version

Date Issued: December 12, 2022

Applications Due: **February 6, 2023 (by 11:59:59 PM EST)**

Point of Contact: Dr. Mingsheng Wei
NLUF Manager
Laboratory for Laser Energetics University of
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Electronic application in a single **PDF file** must be submitted via the [NLUF proposal submission webpage](#) on the LLE website on or before **February 6, 2023**.

PART I: PROGRAM DESCRIPTION

A. Summary

The University of Rochester's Laboratory for Laser Energetics (LLE) is issuing a call for proposal for experiments in the National Laser Users' Facility (NLUF) Program at the Omega Laser Facility in Fiscal Years (FY) 2024 and FY2025. LLE expects to allocate approximately 18% of the Omega Laser Facility time for NLUF experiments each year. Proposals to NLUF may request a series of beam-time access, spanning over one to two years but must be focused on a specific experimental topic. As is always the case, management of the NLUF program is contingent upon funding and authorization. If the enacted budgets contain a significant cut to LLE's Inertial Confinement Fusion (ICF) Program, the time allotted to the NLUF Program under this call may be reduced. Please note the change to the NLUF Program since FY22: this is a solicitation of proposals for facility use only; research funding should be obtained separately through federal agency funding opportunity announcements.

B. NLUF Program Overview

LLE was established in 1970 as a center for the investigation of the interaction of intense radiation with matter. It is the home of the Omega Laser Facility, which includes OMEGA—a 30-kJ UV, 60-beam laser system (at a wavelength of 0.35 μm), and OMEGA EP—a four-beam high-energy UV long-pulse laser system, two of which can be compressed for high-intensity, short-pulse operation (at a wavelength of 1.053 μm). Up to two of the OMEGA EP short-pulse beams or one of the OMEGA EP long-pulse UV beams (wavelength tunable) can be coupled with the OMEGA-60 laser for joint operation in the OMEGA target chamber.

The Office of Experimental Sciences of the National Nuclear Security Administration (NNSA) within the U.S. Department of Energy (DOE) funds the operations of LLE and specifically, of NLUF, thus making it possible for users to conduct experiments without a direct facility charge. The NLUF Program provides access to the Omega Laser Facility for university and industrial scientists to perform basic research in high-energy-density (HED) physics and inertial confinement fusion (ICF). Proposals will be judged on their scientific merit, technical feasibility, and broader impact.

LLE's Cooperative Agreement with the DOE/NNSA specifies that approximately 18% of the OMEGA and OMEGA EP beam time each year be available for the NLUF. LLE researchers are available for scientific collaboration and for assistance with user experiments. Principal Investigators (PI's) are encouraged to collaborate with LLE staff members.

For information about the Omega Laser Facility and further information about the NLUF Program, including a User's Guide, please visit: <https://www.lle.rochester.edu/>. Questions relating to the Omega Laser Facility, the current experimental capabilities, and this call for proposal should be addressed to NLUF Manager, **Dr. Mingsheng Wei**.

As in the past, NNSA will fund General Atomics (GA) to provide fabrication support for standard or off-the-shelf types of targets as needed for approved NLUF experiments. PI's must contact **Michael Farrell** (phone: 858-455-3975, email: Michael.Farrell@ga.com) and **Claudia Shuldborg** (phone: 858-455-2605, email: Claudia.Shuldborg@ga.com) at GA to discuss their target needs for the proposed work before submitting proposals. If there are any LLE-specific target issues (such as the need for specific fill gases, especially ^3He ; use of hazardous materials; on-site metrology needs; etc.) for the proposed NLUF experiments, PI's must contact **Dr. David Harding** (phone: 585-275-5850, email: ddhar@lle.rochester.edu) before submitting proposals.

C. Program Purpose and Objectives

The objective of the NLUF Program is to provide access to the Omega Laser Facility for university and industry-led basic science experiments through an independent peer-review proposal process. Specifically, this program is intended to provide access to the Omega Laser Facility to a broad community of academic and industrial research interests for:

- a) conducting basic laser–matter interaction, and ICF and HED physics research, and
- b) providing research experience necessary to maintain a cadre of trained scientists to meet the nation’s future needs in these areas of science and technology.

Recipient’s project objectives should align with the aforementioned program objectives. Upon selection, recipients are to submit annual progress reports to LLE and are encouraged to attend the annual Omega Laser Facility Users Group (OLUG) Workshop.

1. Topical Research Areas

The unique research tools and resources of LLE’s Omega Laser Facility are available to eligible users (as defined in Part III) to conduct state-of-the-art basic research in high-energy-density laboratory plasmas (HEDLP). Generally, HEDLP research is directed at exploring the behavior of matter at extreme conditions of temperature, density, and pressure, including laboratory astrophysics and planetary science, structure and dynamic of matter at the atomic scale, laser–plasma interactions and relativistic optics, magnetohydrodynamics (MHD) and magnetized plasmas, and plasma atomic physics and radiation transport.

The specific areas of interests include, but not limited to:

- a) HED hydrodynamics
- b) radiation-dominated dynamics and material properties
- c) magnetized HED plasma physics
- d) nonlinear optics of plasmas and laser–plasma interactions
- e) relativistic HED plasmas and intense beam physics
- f) warm dense matter
- g) high-Z, multiply ionized HED atomic physics
- h) diagnostics and platforms for HED laboratory plasmas
- i) other (please specify)

Basic research is defined as research directed toward increasing knowledge in a particular field of science. Research findings from the NLUF experiments are expected to be broadly disseminated including journal publications.

All proposed work to be conducted through this program announcement should be basic research. No proposals for propriety research or CLASSIFIED work will be accepted. All applicants are responsible for ensuring compliance with all applicable U.S. Export Control laws and regulations and all other applicable security requirements relating to any work performed under a resulting beam-time award.

PART II: SHOT ALLOTMENT (AWARD) INFORMATION

A. Type of Award

Omega Laser Facility access allocated in units of “shot days” will be awarded.

Note: As in the past, NNSA will fund General Atomics (GA) to provide fabrication support for standard or off-the-shelf types of targets as needed for awarded NLUF experiments. Target needs must be specified in the proposal, and are evaluated as part of the NLUF review process.

B. Expected Number of Awards

The exact number of awards will depend on the number of meritorious applications and the availability of the shot time allotted for the NLUF program. A total notional allotment of up to 34 shot days per year in FY24 and FY25 of the Omega Laser Facility time (OMEGA and OMEGA EP) may be available for this Program. For shot time allocation purposes, a joint OMEGA and OMEGA EP target shot day is equivalent to one and a half days (one OMEGA shot day and 0.5 OMEGA EP shot day).

C. Anticipated Award Size

The minimum facility time allotment is anticipated to be half a day for OMEGA, and one day for OMEGA EP, respectively. The maximum allotment for each award will be limited to two days per year.

Facility time is awarded, not a specific number of shots. The number of shots that can be accomplished per day is a function of experimental complexity. For planning purposes, one OMEGA shot day typically produces 11 to 14 shots while one OMEGA EP shot day typically yields 6 to 14 shots depending on configuration.

D. Period of Performance

The program is for OMEGA and OMEGA EP experiments in FY24–FY25 starting October 2023 and through September 2025.

LLE will make every effort to schedule experiments as outlined in this Call and, once scheduled, to execute the runs on time. Omega Laser Facility can fully support remote PI shot operation. In this mode, users are not on-site but instead leading their experiments online while facility and experimental support staff set up and deliver the shots.

E. Limitations on the Applications by Same Organization or Institution

There is no limit on the number of distinct proposals the same institution/organization or PI can submit to this call. Multiple submissions from the same team for similar experiments will not be considered.

F. Required Acknowledgement for Successful Applications

If awarded, recipients must acknowledge the Omega Laser Facility and DOE/NNSA in presentations and publications using the template: *“The experiment was conducted at the Omega Laser Facility at the University of Rochester’s Laboratory for Laser Energetics with the beam time through the National Laser Users’ Facility (NLUF) Program supported by DOE/NNSA.”*

PART III: Eligibility Information

A. Eligible Applicants

Only proposals led by researchers from universities, * nonprofits, and private sector companies in the U.S. will be considered for this call. Researchers from non-U.S. institutions can be collaborators on NLUF projects.

Proposals should not duplicate efforts currently being conducted or proposed to be conducted at the Omega Laser Facility through the NNSA-supported Laboratory Basic Science (LBS) Program or the Office of Fusion Energy Sciences-funded LaserNetUS program.

Consistent with the UR/LLE and NNSA policies, additional information will be required for all non-U.S. persons who will be involved in the proposed project if the application is selected for an NLUF beam-time award. A “U.S. person” is defined as an individual who is a U.S. citizen or an alien lawfully admitted for permanent residence.

*Note: Researchers from the University of Rochester’s academic departments who are not affiliated with LLE can submit NLUF facility time proposals.

PART IV: APPLICATION AND SUBMISSION INFORMATION

A. Application Package

All application forms and instructions are included in this solicitation.

B. Content and Form of Application

1. Cover (1 page)

The cover page of the proposal shall include all the information requested in Appendix A.

2. Proposal Summary Sheet (1 page)

The second page shall be the Proposal Summary Sheet using the template in Appendix B.

3. Project Narrative (not more than 8 pages)

The project narrative **MUST NOT** exceed **8** pages, including text, figures, and tables, printed using standard 8.5-in. by 11-in. paper with 1-in. margins (top, bottom, left, and right). The font must not be smaller than 11 point. Do not include any Internet addresses (URL's) that provide information necessary to review the application because the information contained in these sites will not be reviewed. The project narrative must include:

Abstract: Provide a single paragraph summarizing the proposed experiment, quantities to be measured, samples to be studied, expected scientific results, and impact.

Scientific Case: Describe the background, the objectives of the experiment, the scientific questions to be addressed, the proposed experimental method including the specific measurements to be made, the expected outcome and impact, and the relevance to the objectives in the program announcement. Also discuss why the proposed experiment is uniquely suited to OMEGA and/or OMEGA EP. The experimental designs should be described, including simulations, predictions, and previous experimental results (if any) that shows the goals of the proposed experiment can be achieved. The proposal should focus on the specific experiment.

Proposed Experiments and Expected Results: Please describe the proposed experimental configurations, geometry, requirements of the laser, diagnostics and targets, number of the shot days and the expected number of shots, preliminary shot plan, and the data to be collected. A schematic layout of the experiment should be included. This section should contain sufficient information so that reviewers will be able to evaluate the application in accordance with the merit review criteria listed in Part V. Section A.

- 1) **Laser and Experimental Configuration:** Provide information on the required OMEGA and/or OMEGA EP laser, including number of beamlines, total energy on target, beam-to-beam energy variance, pulse shape, beam-smoothing requirements, beam timing and synchronization requirements, beam pointing, laser diagnostics, and the primary target physics diagnostics and specific measurements with the needed primary diagnostics, number of shot days, and expected number of shots. Also indicate whether the experiment will use an existing platform and existing diagnostics or will require new capabilities and/or new diagnostics.

- 2) **Equipment:** Information on the experimental equipment requirements of the projects, including both standard equipment items, which may be provided by UR/LLE, and any special equipment to be purchased or provided by the applicant.
- 3) **Targets:** Describe proposed target types, number, and confirm the discussion PI has with NLUF target primary supplier GA (and LLE for LLE-specific target support). Note: Limited funding for standard or off-the-shelf type targets for the approved NLUF experiments will be provided by the NNSA directly to GA. Prospective PI must provide an adequate description of the proposed targets to allow GA to assess feasibility and estimate a cost as part of the proposal review process. Users having the capability to provide their own unique targets are encouraged.

Project Timetable and Shot Plan: (a) Outline as a function of time, year by year, all the important activities or phases of the project including supporting activities; and (b) provide a shot plan including decision points and contingency plan if results differ significantly from prediction.

Merit Review Criteria Discussion: The section should briefly address each of the merit review criterion listed in Part V, Section A.

4. Appendices to Project Narrative Information

All applicants must complete the following appendices and attach them to the final Project Narrative document. All of the requested information for the following appendices will not count in the Project Narrative page limitation.

Appendix 1. Bibliography and References Cited:

Provide a bibliography for any reference cited in the Project Narrative.

Appendix 2. Funding Sources:

Users are responsible for their own travel and any extraordinary consumables required by the experiment. List available funding sources to support the execution of the proposed experiment. [Note: NNSA may provide travel support for researchers who have been granted NLUF shot time at the Omega Laser Facility to execute the experiments if such support will be needed.]

Appendix 3. Summary of Previous NLUF Project (not more than one page)

If this proposal is the continuation of a previously awarded experiment through NLUF, please include a brief summary of the experiments conducted, the status of the analysis, and results disseminated (list major invited talks, papers published or in press, awards or special recognition, and graduate students being trained and/or advanced degrees obtained).

Appendix 4: Three-Page Overview of the Proposed Experiment

The Overview shall include all the information requested in Appendix C.

C. Submission Requirements

Submit electronic applications in a single **PDF file** via the [NLUF proposal submission webpage](#) on the LLE website. Applications must be received by **February 6, 2023**, not later than 11:59:59 PM Eastern Time.

PART V – APPLICATION REVIEW INFORMATION

A. Criteria

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, UR/LLE will perform an initial compliance review to determine that (1) the applicant is eligible for an award; (2) the information required by the announcement has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the OMEGA/OMEGA EP shot opportunity announcement.

2. Merit Review Criteria

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria:

- 1) The overall scientific/technical merit of the project and its relevance and prospective contribution to its field of research;
- 2) The scientific/technical soundness and quality of the proposed method/approach, and the feasibility/likelihood of accomplishment of the stated objectives;
- 3) The competence, experience, and past performance of the proposer, principal investigator, and key team members;
- 4) The broader impact of the project on education and workforce development (e.g., academic or training opportunities to students or early career researchers), and expanding scientific ecosystem (e.g., new research topic areas, engaging with new users particularly from underrepresented groups or institutions, the proposed experiment being part of larger project or program, etc.); and
- 5) The demands of the project in terms of resource requirements (equipment, beam time, target support, etc.) and/or other requirements (facility hardware modifications, component development, etc.) vis-à-vis competing demands.

B. Review and Selection Process

1. Review

Applications that pass the initial compliance review will be subjected to both merit review by an independent, external review panel in accordance with the guidance provided above and the technical feasibility review including resource demands by LLE.

2. Selection

LLE Director will make the final decision concerning the award of OMEGA/OMEGA EP shot opportunities for this Program based on the peer review panel recommendations and the facility feasibility and executability assessments. Diversity, Equity, Inclusion and Accessibility principles, diversity of institution, and diversity of science will be considered in the selection process.

PART VI: AWARD ADMINISTRATION INFORMATION

A. Award Notices

1. Notice of Selection

LLE will notify applicants selected for award in April 2023.

B. OMEGA Operations Requirements

1. OMEGA Laser Facility Organization and Regulation Manual (LFORM)

All users of the Omega Laser Facility are expected to comply with the UR/LLE Laboratory policies and procedures as identified in the OMEGA Laser Facility Organization and Regulation Manual (LFORM) Instruction 3000 which can be found at:

<https://www.lle.rochester.edu/index.php/omega-laser-facility-2/omega-laser-facility-documentation/>

APPENDICES

- A. Proposal Cover Page (template)**
- B. Proposal Summary Sheet (template)**
- C. Three-Page Overview of the Proposed Experiment (template)**

Appendix A: Proposal Cover Page

**NLUF Experiments
at the Omega Laser Facility—FY2024 and FY2025**

Proposal Title (a descriptive title of your proposed experiment that will be made public if awarded)
Research Topic Area (see Part I, C.1.):
<p>Lead Principal Investigator (PI) [Lead PI is the primary point of contact for the proposed experiment, typically overseeing the project team, leading the designs and/or experiments and analysis effort. A Co-PI is required for all submissions when a student or postdoctoral researcher is the Lead PI. In this case, Co-PI is typically the supervisor and is expected to provide oversight, funding, and other resources to execute the experiment.]</p> <p>Name Job Title Department Institution Mailing address Telephone:</p>

Tentative Research Team: (List all team members that you expect to be involved in the proposed research including Lead PI, Co-PI, students, postdocs, research staff; and describe their roles.)

Name	Affiliation	Email	Job Title	Tentative Role [Lead PI, Co-PI, experimental, theory/simulation, other (specify)]	Citizenship

Appendix B: Proposal Summary Sheet (template, 1 page)

Proposed Project Objectives: (A single paragraph describing the science to be addressed, expected impact, and the need for Omega to pursue the science.)
Experimental Approach: (A single paragraph describing the experimental method, existing platform to be used, or if new capabilities will be required.)
Laser Facility Requirements: (OMEGA, OMEGA EP, or joint; number of laser beams, pulse shape, energy per beam, power, or kJ on target, delays, etc.)
Number of Shot Days: (Number of requested shot days and expected number of shots.)
Target Types: (Hohlraums or half-hohlraum, capsules, planar, expected materials in the targets, gas-filled/vacuum targets, number of targets, target suppliers, hazardous materials, etc.)
Primary Diagnostic Required: (TIM-based and fixed-port diagnostics, modifications to existing diagnostics or new diagnostics if any.)
New Developments Required: (Laser capabilities, diagnostics, targets, etc.)

Appendix C: Three-Page Overview of the Proposed NLUF Experiment in FY24–FY25
(PowerPoint template file is available on the NLUF submission page.)

NLUF FY24–FY25	OMEGA/OMEGA EP
Proposed campaign/experiment name:	
<div><ul style="list-style-type: none">• <u>Purpose/goal:</u><ul style="list-style-type: none">• To measure• <u>Specific deliverable(s) of the proposed campaign (in FY24–25):</u><ul style="list-style-type: none">• To measure• <u>What would we do with results:</u><ul style="list-style-type: none">• Compare with• <u>PI/Designer/Shot PI:</u><ul style="list-style-type: none">• • <u>Technical issues (e.g., target design/fab, diagnostics, reconfiguration, etc.):</u><ul style="list-style-type: none">• Tfab Review: <input type="checkbox"/> GA budget estimate: \$ LLE Budget estimate: (hr/\$)</div>	

NLUF FY24–FY25	OMEGA/OMEGA EP
Proposed campaign/experiment name:	
<div>VISRAD model configuration or schematic for the proposed experiments</div>	

Proposed campaign/experiment name:**Experimental configuration****No of shots or days required:****Schedule request (by quarter, FY24–25):**

(If your proposal is selected for a beam-time awarded and the PI could be ready for shots in Q1FY24, please specify it.)

Facility (OMEGA or EP or Joint):

You must unambiguously provide the following information for each configuration on each shot day covered by this 3-page summary

Beam configuration:

OMEGA 60: Number of beams, Number and Type of DPPs, 2w/3w/4w probe beam (if required), and experiment axis
OMEGA EP: Required mode for each beam (SP, SP CoProp, UV, or T-OPA)

Primary diagnostics:

List all required diagnostics (fixed or TIM-based)

Targets: (More instructions in the next page)

DT or DD, Special Fills, Geometry, Material, Scale
For EP, all components not expected to survive the shot, driven or otherwise, must be identified including scale, to determine if the OAP dds will be required

Targets contain Z>36 material: (Yes/No)**Spectrometer in use (Yes/No)****Target schematics, definition and number for the proposed experiments**

General Atomics provides fabrication support for standard or off-the-shelf types of targets as needed. Please contact GA target fab to discuss your target needs with adequate definition (see the instruction below) before submitting your NLUF proposal. Also contact LLE target fab for LLE-specific target items before submitting your proposal.)

- Define whether this is an existing target design, and if not what development is required
- Include targets diagrams with materials, dimensions and number of assembled targets
- Indicate number of variations which include different outer diameters (ODs), thickness, materials, etc
- Indicate materials of each layer, CH vs metal (specially if the request requires Beryllium)
- Indicate number of gas fills and pressures required, especially if the request will require D3He/ DT to coordinate with LLE
- Indicate If targets will be attached to MIFEDS to coordinate with LLE
- Include pie diagrams for capsules request and developmental targets
- Specify density and tolerances for foam and 2pp targets requested
- Specify tolerances for all dimensions
- Table 1 refers to typical tolerances for different materials of capsules (these values are meant as guideline only, they may not cover all different cases/campaigns)
- Define acceptable surface roughness if it is a critical parameter
- Define glue layer thickness/quality and/or glue spot size/quality for the stalk mounting if they are critical parameters

Table 1. Typical tolerances for capsule fabrication

Material for capsules	Detail	OD tolerance (um)	Layer thickness tolerance (um)
CH	CH	20	1
doped layer	SiCH/GeCH/CuCH	20	1
at%	SiCH/GeCH/CuCH	NA	1
Metal Multilayer	metal thickness <1um - flip coating	25	0.2
Metal Multilayer	metal thickness >1um - flip coating	25	0.5
Metal Multilayer	metal thickness >1.5um - roll coating	25	1
Hoppe glass	wall thickness <4um	50	0.5
Hoppe glass	wall thickness >4um	50	1
Drop tower	OD 420um	25	0.3
Drop tower	OD 860um	50	0.5
Metal only	roll coating eg. Be	25	2

For assembly

- For each target type and configurations specify target positioner and critical surface normal
- Critical assemble angles and tolerances

POC for targets:

GA: M. Farrell (Michael.Farrell@ga.com)
C. Shulberg (Claudia.Shulberg@ga.com)
LLE: D. Harding (dhar@lle.rochester.edu)