

**University of Rochester
Laboratory for Laser Energetics**

**National Laser Users' Facility (NLUF) Call for Proposal
For Experiments at the Omega Laser Facility
Fiscal Years 2022 to 2023**

Date Issued: March 3, 2021

Applications Due: April 5, 2021

Point of Contact: Dr. Mingsheng Wei
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PART I: PROGRAM DESCRIPTION

A. Summary

The Laboratory for Laser Energetics (LLE) of the University of Rochester is issuing a call for proposal for experiments in the National Laser Users' Facility (NLUF) program on the Omega Laser Facility starting nominally in quarter (Q) 2 of Fiscal Year (FY) 2022 and through FY2023. In order to manage the disruption to the FY2020 and FY2021 Omega shot schedules from the COVID-19 pandemic, while maintaining the commitment for the NLUF time previously awarded, some FY2021 NLUF days have moved into Q1FY2022 reducing the time available for this call. LLE expects to allocate about 26 days and up to 34.5 days of facility time for NLUF experiments in FY2022 and FY2023, respectively. Proposals to NLUF may request a series of beam-time access, spanning over one to two years, but must be focused on one experimental topic. As is always the case, management of NLUF program is contingent upon funding and authorization. If the FY2022 and FY2023 enacted budgets contain a significant cut to LLE's Inertial Confinement Fusion (ICF) Program, the time awarded to the NLUF program under this call may be reduced. Please note a change in FY2022-2023 NLUF: this is a solicitation of proposals for facility use only, support funding should be obtained separately through federal agency funding opportunity calls.

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 the joint operation in the OMEGA target chamber.

The Omega Laser Facility is maintained and operated by LLE for the National Nuclear Security Administration (NNSA) within the U.S. Department of Energy (DOE). The NNSA-supported NLUF program provides access to the Omega Laser Facility for university and industrial Scientists to perform basic science experiments in high-energy-density (HED) physics and ICF, including laser-matter interactions, such as laboratory astrophysics and planetary science, properties of materials under HED conditions, laser-plasma instabilities, etc. Proposals will be judged on their scientific merit and technical feasibility.

The cooperative agreement for LLE 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 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**.

For technical information specifically related to NLUF target fabrication support by General Atomics, principal investigator (PI) should contact **Paul Fitzsimmons** (phone: 858-455-2052, email:

fitsimmons@fusion.gat.com) before submitting their proposal. 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, please contact **Dr. David Harding** (phone: 585-275-5850, email: dhar@lle.rochester.edu).

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 a 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, ICF and HEDP 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 annual Omega Laser Facility Users Group (OLUG) Workshop.

1. Technical Scope and Topical Research Areas

The technical scope of the Program is to encourage U.S. scientists and industrial specialists (by making available unique research tools and resources) to conduct state-of-the-art "basic research" in the areas of interest that include the following (but are not limited to):

- a) HED Hydrodynamics
- b) Radiation Dominated Dynamics and Material Properties
- c) Magnetized HED Plasmas
- 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) Plasma and Nuclear Physics
- i) Diagnostic and Experimental Platform Development

"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 is to be UNCLASSIFIED. No proposals for CLASSIFIED work will be accepted.

D. Solicitation Schedule

<u>Event</u>	<u>Target Date</u>
Program Announcement Issued	March 3, 2021
Applications due (via pdf files)	April 5, 2021
Decision on applications	May 2021
Experiments conducted	January 2022 to September 2023

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 directly fund General Atomics to provide fabrication support for standard or off-the-shelf types of targets as needed for NLUF experiments. Target needs must be specified in the proposal, evaluated as part of the NLUF review process.

B. Expected Number of Awards

A total notional allotment of approximately 26 days in FY2022 and up to 34.5 days in FY2023 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 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. Proposals that require less than the required minimum time on a laser will not be accepted. The maximum allotment for each award on a specific research topic will be limited to two days per year.

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 target shots while one OMEGA EP shot day typically yields 6 to 14 shots depending on configurations.

D. Period of Performance

The program is for OMEGA and OMEGA EP shots starting Q2FY2022 and through Q4FY2023.

LLE will make every effort to schedule experiments as outlined in the call for proposals 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. For more information about the Omega remote PI operation, please visit the LLE website.

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 with the beam time through the National Laser Users’ Facility (NLUF) under the auspices of the U.S. DOE/NNSA by the University of Rochester’s Laboratory for Laser Energetics under Contract DE-NA0003856.”

PART III: Eligibility Information

A. Eligible Applicants

Only proposals led by researchers with an academic institution* or the private sector from the U.S. will be considered for this call. Researchers from non-U.S. institutions can be collaborators on NLUF projects.

Acknowledgement and additional information will be required for all non-U.S. Persons involved in the proposed project. A “U.S. Person” is defined as an individual who is a U.S. citizen or an alien lawfully admitted for permanent residence.

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.

*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. Executive Proposal Summary (1 page)

The second page shall be the Proposal Summary Form (see Form B of Appendix B).

3. Facility Experimental Configuration Summary (not more than 2 pages)

The third pages of the proposal shall be the Facility Experimental Configuration Summary describing laser configuration, primary diagnostics and target requirements (see Form C of Appendix C). The primary facility (OMEGA or OMEGA EP or both) where the work will be performed must be indicated. *If the project requires extraordinary support (such as non-standard laser or diagnostics configurations or targets), such requirements and the source of such support must be identified.*

4. Project Narrative (not more than 6 pages)

The project narrative **MUST NOT** exceed **6** 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 (URLs) 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 Motivation: 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 design 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, General Atomics (GA). Note: Funding for standard or off-the-shelf type targets for the approved NLUF experiments will be provided by the NNSA directly to GA to cover the costs for manufacture. It is the responsibility of prospective PI's to provide an adequate description of the targets' construction to allow GA to 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.

5. Appendices to Project Narrative Information

All applicants should 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. This section must include only bibliographic citations from the Narrative and Summary sheets.

Appendix 2. Biographical Sketches:

Provide a biographical sketch for the principal investigator and no more than five additional key team members. A key team member is any individual who contributes in a substantive, measurable way to the scientific/technical development or execution of the project. The biographical information for each person should include education and training, research and professional experience, relevant publications, and synergistic activities. The biographical information for each person must not exceed 2 pages when printed on 8.5-in. by 11-in. paper with 1-in. margins (top, bottom, left, and right) with the font not smaller than 11 point.

Appendix 3. 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.

Appendix 4. Summary of Previous NLUF Project (not more than one page)

If the applicant or the project team performed similar experiments before 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, graduate students being trained and/or advanced degrees obtained).

C. Submission Dates and Times

Applications must be received by **April 5, 2021**, not later than 11:59:59 PM Eastern Time.

You are encouraged to transmit your application well before the deadline.

APPLICATIONS RECEIVED AFTER THE DEADLINE MAY NOT BE REVIEWED OR CONSIDERED FOR AWARD.

D. Submission Requirements

Applicants must submit the full written proposal in a single **PDF file** via the [NLUF proposal submission webpage](#) on the LLE website.

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 as well as its broad impact;
- 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/or key personnel; and,
- 4) 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.

Note that external proposal review committee members will be selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Technical feasibility of the proposed experiment and the demands of the project will be evaluated by LLE and will be provided to the Merit Review Committee.

B. Review and Selection Process

1. Review

Applications that pass the initial compliance review will be subjected to both merit review by an independent Proposal Review Committee in accordance with the guidance provided above and the technical feasibility and facility impact review 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 committee recommendations and the facility feasibility assessments.

C. Anticipated Notice of Selection and Award Dates

Successful principal investigators will be notified in May 2021 for experiments to be conducted starting on January 2022 through September 2022.

PART VI: AWARD ADMINISTRATION INFORMATION

A. Award Notices

1. Notice of Selection

LLE will notify applicants selected for award.

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 Executive Summary Sheet (template)**
- C Facility Experimental Configuration Summary (template)**

Appendix A: Proposal Cover Page (Template, 1 page)

**NLUF Experiments
at the Omega Laser Facility—FY2022 and FY2023**

Proposal Title:
Project Topic Area:
Principal Investigator (PI): (Name, Institution, Address, Telephone and Email address)
Project Team: (list the names, citizenships, institutions, email addresses of PIs and collaborators who would participate in the proposed experiment and describe their roles)

Appendix B: Executive Summary Sheet (Template, 1 page)

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

Appendix C: Facility Experimental Configuration Summary (not more than 2 pages)

Facility Required: OMEGA 60 Beam OMEGA EP Joint (OMEGA/OMEGA EP)

Laser Beam Configuration:

OMEGA Drive:

Pulse shape: _____ (If new, the design must be received by LLE two months in advance of planned shots):

Number of Beams: _____

Energy (per beam, power setting, or kJ on target): _____

Number and Type of Distributed phase plates (DPP's): _____

OMEGA Backlighter:

Pulse shape: _____ Energy: _____ Drivers: _____

Beams: _____

DPP's: _____ Pointing: _____ Delays: _____

2 ω or 3 ω or 4 ω probe beam (if required): _____

OMEGA EP:

(Specify the required mode for each beam, i.e, short pulse, short pulse co-prop, UV or T-OPA)

Beam	Circle	Requested Configuration	Pulse shape/width	Energy (J)
1	UV	IR Short-Pulse Sidelighter	_____	_____
2	UV	IR Short-Pulse Backlighter	_____	_____
3	UV	_____	_____	_____
4	UV	_____	_____	_____

Primary Diagnostics:

TIM based: _____

Fixed: _____

Modifications to existing diagnostics: _____

New diagnostics (please describe): _____

Target Requirements:

If hohlraum or half-hohlraum specify:

Axis: _____

Scale size: _____

Material and thickness: _____

If spherical specify:

Diameter/thickness: _____

Materials: _____

Fill gas (DT or DD, or special fills): _____

If other types of target, please describe: _____
(For EP, all components not expected to survive the shot, driven or otherwise, must be identified including scale, to determine if the OAP disposable debris shield will be required)

Target Fabrication:

Total number: _____

Standard target: Yes No

Targets supplied by: _____

Hazardous materials: _____

Target positioner (list all required, fixed and/or TIM-based): _____

Targets contain Z>36 material: (Yes/No)

Spectrometer in use: (Yes/No)

Safety Related Concerns: Yes No

If YES, please describe: _____

(List and describe any safety concerns that may arise with samples you will examine, equipment you will use, or techniques you will perform, including any physical, chemical or biological hazards, and how these issues will be addressed.)

Schedule Request (for shots in FY22 only, by quarter):

(If your proposal is selected for a beam-time award, please specify your scheduling preference.)