

**University of Rochester  
Laboratory for Laser Energetics**

**Laboratory Basic Science Experiments  
at the Omega Laser Facility  
Fiscal Year 2021**

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Applications Due: March 27, 2020

Point of Contact: Dr. Mingsheng Wei  
Senior Scientist  
Manager, National Laser Users' Facility  
Laboratory for Laser Energetics  
University of Rochester  
Tel: (585)-275-3866  
Email: [mingsheng@lle.rochester.edu](mailto:mingsheng@lle.rochester.edu)

# PART I – LABORATORY BASIC SCIENCE PROGRAM DESCRIPTION

## A. BACKGROUND

The University of Rochester's (UR) Laboratory for Laser Energetics (LLE) 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- $\mu\text{m}$ ), 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- $\mu\text{m}$ ). 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 UR/LLE for DOE/NNSA. As a part of its mission, UR/LLE provides shot opportunities on the Omega Laser Facility to participating laboratories in the NNSA ICF program (LLNL, LANL, SNL, NRL, and LLE) and the DOE Office of Science laboratories (Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma Physics Laboratory, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility) to conduct basic science experiments in the general areas related to high-energy-density physics using high-power lasers.

Subject to funding, ~11% of the annual operating time of the Omega Laser Facility may be available for Laboratory Basic Science (LBS) experiments in Fiscal Year 2021 (FY21). The LBS Program is administered by UR/LLE, which issues an annual solicitation proposal. All the proposals submitted to this call will be reviewed by the LBS Proposal Review Panel (PRP) consisting of experts from the academics and user laboratories. The PRP will make recommendations to the LLE Director of proposals in rank order including a recommended time allocation at the Omega Laser Facility. Proposals will also be reviewed by the Omega Laser Facility team for feasibility assessment.

## B. RESEARCH AREAS

The unique research tools and resources of the Omega Laser Facility at UR/LLE are available to laboratory scientists (as defined in Section A) to conduct the state-of-the-art basic science research in the following topical areas (but not limited to):

- (a) High-Energy-Density Hydrodynamics;
- (b) Magnetized High-Energy-Density Plasmas;
- (c) Nonlinear Optics of Plasmas;
- (d) Radiation-Dominated Dynamics and Material Properties;

- (e) Relativistic HED Plasmas and Intense Beam Physics;
- (f) Warm Dense Matter;
- (g) High-Z, Multiply Ionized HED Atomic Physics; and
- (h) Plasma and Nuclear Physics.

Basic research is defined as research directed toward increasing knowledge in a particular field of science. The primary aim of basic research is a fuller knowledge or understanding of the subject matter under study, rather than any immediate application of that knowledge to NNSA's mission. Science relevant to inertial fusion will be considered but will be judged solely on the basis of its quality as basic science. In particular, the results of the experiment must be of significant interest in other fields, consistent with guidelines for publication in a highly ranked journal. Upon selection, recipients are to submit annual progress reports to LLE.

## **PART II – SHOT ALLOTMENT (AWARD) INFORMATION**

### **A. TYPE OF AWARD INSTRUMENT**

Only Omega Facility time (including OMEGA EP) is available through this competition. Users are generally responsible for their own travel and target expenses as well as any significant consumables required by the experiment.

### **B. EXPECTED NUMBER OF AWARDS**

A total notional allotment of approximately 11 OMEGA and 10 OMEGA EP shot days may be available for this program in FY21. For planning purposes, one OMEGA shot day typically produces 11 target shots while one OMEGA EP shot day is expected to produce approximately 7 target shots. 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 shot allotment is anticipated to be one half-day (0.5) 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. While there is no maximum shot allocation beyond those stated in Section B above, the normal shot allotment for each award is 1 to 2 days.

### **D. PERIOD OF PERFORMANCE**

The program is for OMEGA and OMEGA EP shots during FY21 only.

## **PART III – ELIGIBILITY INFORMATION**

### **A. ELIGIBLE APPLICANTS**

Only proposals led by scientists from the NNSA ICF laboratories (LLNL, LANL, SNL, NRL, and LLE), and the DOE Office of Science laboratories (Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma Physics Laboratory, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility) will be considered for this program. These proposals should not duplicate efforts being conducted or proposed to be conducted through the NNSA-supported UR/LLE NLUF program and the Office of Fusion Energy Sciences-funded LaserNetUS program, nor proposals submitted through the ICF and HED Omega Facility allocations.

## **PART IV – APPLICATION AND SUBMISSION INFORMATION**

### **A. APPLICATION PACKAGE**

All application forms and instructions are included in this solicitation.

### **B. LETTER OF INTENT AND PRE-APPLICATION**

#### **1. Letter of Intent**

Letters of Intent are not required.

#### **2. Pre-application**

Pre-applications are not required.

### **C. CONTENT AND FORM OF APPLICATION**

#### **1. Cover**

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

#### **2. Facility Requirements/Proposal Summary**

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

#### **3. Project Narrative**

The project narrative **MUST NOT** exceed **10** pages, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5-in. by 11-in. paper with 1-in. margins (top, bottom, left, and right). **EVALUATORS WILL REVIEW ONLY THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE.** 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:

Project Objectives. This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

Scientific and Technical Merit. This section should address how the project will advance the current state of science and technology in alignment with the LBS Program described in Part I. Address the scientific and technical risks associated with the proposed approach. The section should address each of the merit review criterion and sub-criterion listed in Part V. Section A. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with these merit review criteria.

Relevance and Outcomes/Impacts. This section should explain the relevance of the effort to the objectives in the program announcement and the expected outcomes and/or impacts.

Project Timetable. This section should outline as a function of time, year by year, all the important activities or phases of the project, including any activities planned beyond the project period. Successful applicants must use this project timetable to report progress.

Equipment. Information on the experimental equipment requirements of the project, including both standard equipment items, which may be provided by UR/LLE, and any special equipment to be purchased or provided by the applicant.

Laser Configuration. Provide information on the OMEGA and/or OMEGA EP laser, diagnostics, and target requirements for the proposed work, including number of shots, number of beamlines, total energy on target as well as a beam-to-beam energy variance, pulse shape, beam smoothing, plasma and laser diagnostics, and other requirements that are important to the conduct of the proposed experiment.

Users are encouraged to contact the facility. Consult the Omega Laser Facility Users' Guide in the link below for facility information:

<http://www.lle.rochester.edu/about/nluf.php>

Targets. Describe proposed target types, number, suppliers, and method of obtaining targets.

Roles of Collaborators/Participants. Information on collaboration with scientists at UR/LLE or other institutions that are required to conduct the proposed work, including official institutional confirmation of the acceptance of such

collaborations in Appendix 5. For multi-organizational or multi-investigator projects, describe the roles and the work to be performed by each participant/investigator, business agreements between the applicant and participants, and how the various efforts will be integrated and managed. This section must not exceed 1 page.

#### **4. 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 of no more than 10 pages.

##### **Appendix 1. Bibliography and References Cited:**

Provide a bibliography for any reference cited in the Project Narrative Section. This section must include only bibliographic citations.

##### **Appendix 2. Biographies:**

Provide a biographical sketch for the principal investigator and each senior/key person proposed. A senior/key person 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. Facilities and Other Resources:**

This information is used to assess the capability of the organizational resources available to perform the effort proposed. Identify the facilities to be used (laboratory, office, laser, etc.) at each performance site listed and, if appropriate, indicate their capacities pertinent resources that are directly applicable to the proposed work, relative proximity, and extent of availability to the project. Describe other resources available to the project such as machine and electronic shops and the extent to which they would be available to the project.

##### **Appendix 4. Funding Sources:**

Users are generally responsible for their own travel and target expenses as well as any extraordinary consumables required by the experiment. List available funding sources to support the execution of the proposed experiment.

**Appendix 5. Collaboration Letters:**

Include official institutional confirmation of the acceptance of collaborations (if applicable).

**Appendix 6. Three-Page Summary of the Proposed Experiments in FY21:**

Applicants must provide a summary of their proposed experiments in FY21 indicating the title, PI's name, purpose and goals of the experiments; laser, target and diagnostics configurations; and the preferred schedule placement including an indication of whether any of the proposed shots could be carried out in Q1FY21. This is for the facility planning purpose. A template of the three-page summary is included as Appendix D at the end of this document.

**D. SUBMISSION DATES AND TIMES**

Applications must be received by **March 27, 2020**, 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.

**E. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS**

**APPLICATIONS MUST BE SUBMITTED VIA E-MAIL**

Submit electronic applications in a single **PDF file** to:

[omegabasicscience@lle.rochester.edu](mailto:omegabasicscience@lle.rochester.edu)

## PART V – APPLICATION REVIEW INFORMATION

### A. CRITERIA

#### 1. Initial Review Criteria

Prior to a comprehensive merit evaluation, UR/LLE will perform an initial 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; (4) the proposed project is responsive to the objectives of the OMEGA/OMEGA EP shot opportunity announcement, and (5) the proposed experiments are consistent with the capabilities of the facility.

#### 2. Merit Review Criteria

Applications will be reviewed in accordance with the following criteria:

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance (with a relative weighting in the approximate ratio of 4:3:2:1):

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/or key personnel; and,
4. The demands of the project in terms of resource requirements (beam time and equipment, etc.) and/or other requirements (facility hardware modifications, component development, etc.) vis-à-vis competing demands.

Teams that have previously been awarded Omega LBS time on the same topic must provide a description of what has been learned, the status of the analysis, and a list of publications from previous LBS experiments. Failure to publish in a timely manner will impact the chances of a successful application in a similar area.

Although it is not required, involvement of postdoctoral researchers and students in the proposed LBS experiment is encouraged.

## **B. REVIEW AND SELECTION PROCESS**

### **1. Merit Review**

Applications that pass the initial review will be subjected to a merit review in accordance with the guidance provided in Section A above.

### **2. Selection**

The UR/LLE Director will make the final decision concerning the award of OMEGA/OMEGA EP shot opportunities for the LBS Program based on the peer review committee recommendation and the facility feasibility assessment.

## **C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES**

Successful principal investigators will be notified on or about May 8, 2020 for experiments to be conducted in FY21 starting on October 1, 2020.

## **PART VI – AWARD ADMINISTRATION INFORMATION**

### **A. AWARD NOTICES**

#### **1. Notice of Selection**

UR/LLE will notify applicants selected for award.

### **B. OMEGA OPERATIONS REQUIREMENTS.**

#### **1. LFORM**

Users of the UR/LLE facilities are expected to comply with the UR/LLE laboratory policies and procedures as identified in the OMEGA Laboratory Facility Organization and Regulation Manual: <http://www.lle.rochester.edu/media/resources/documents/3000.pdf>

## PART VII – OMEGA FACILITY CONTACTS

### A. CONTACTS

Questions relating to the Omega Laser Facility, the Laboratory Basic Science program and proposal submission procedures should be addressed to:

|   |   |
|---|---|
| Dr. Mingsheng Wei                       | Phone: (585)-275-3866   |
| Senior Scientist                        | Fax: (585)-275-5960   |
| Manager, National Laser Users' Facility | Email: <a href="mailto:mingsheng@lle.rochester.edu">mingsheng@lle.rochester.edu</a> |
| Laboratory for Laser Energetics         |   |
| University of Rochester                 |   |
| 250 East River Road                     |   |
| Rochester, NY 14623-1299                |   |

## **APPENDICES**

- A. Proposal Cover Page (template)**
- B. Proposal Summary Sheet (template)**
- C. Facility Experimental Configuration Summary (template)**
- D. Three-Page Summary for the Proposed Experiment (template)**

**Appendix A – Proposal Cover Page**

**Laboratory Basic Science Experiments  
at the Omega Laser Facility in FY21**

|   |  |
|---|--|
| <b>Proposal Title:</b>  |  |
| <b>Project Topic Area:</b>  |  |
| <b>Principal Investigator:</b><br>(Name, Institution, Address,<br>Telephone, and email)   |  |
| <b>Collaborators:</b><br>(List the names, institution, email<br>address of all collaborators including<br>students who would participate in the<br>proposed experiment and describe<br>their roles) |  |
| <b>Submission Date:</b>   |  |

**Appendix B – Proposal Summary Sheet**

**OMEGA/OMEGA EP Laboratory Basic Science Proposal – FY21**

|  |  |
|--|--|
| <b>Principal Investigator:</b><br>(Name, Institution, Address)       |  |
| <b>Title of Proposed Project:</b>                                    |  |
| <b>Proposed Project Objectives:</b>                                  |  |
| <b>Approach:</b>   |  |
| <b>Facility Requirements:</b><br>(OMEGA/OMEGA EP, diagnostics, etc.) |  |
| <b>Number of Shots Days</b>  |  |
| <b>Target Types:</b>   |  |
| <b>Diagnostic Development Required:</b>                              |  |
| <b>Equipment Required:</b>   |  |
| <b>User Provided Equipment:</b>                                      |  |

**Appendix C – Facility Experimental Configuration Summary**

**OMEGA/OMEGA EP Laboratory Basic Science Proposal – FY21**

**Proposed Experiment Title:** \_\_\_\_\_

**Principal Investigator:** \_\_\_\_\_ **Laboratory:** \_\_\_\_\_

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

**Target Requirements:**

If hohlraum  or half-hohlraum  specify:

Axis: \_\_\_\_\_

Scale size: \_\_\_\_\_

Material and thickness: \_\_\_\_\_

If spherical specify:

Diameter/thickness: \_\_\_\_\_

Materials: \_\_\_\_\_

Fill gas: \_\_\_\_\_

If other target, please describe: \_\_\_\_\_

\_\_\_\_\_

**Target Fabrication:**

Total number: \_\_\_\_\_

Standard target:  Yes  No

Targets supplied by: \_\_\_\_\_

Hazardous materials: \_\_\_\_\_

**Laser Configuration:**

**OMEGA Drive:**

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

Beams: \_\_\_\_\_

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

DPP's: \_\_\_\_\_

OMEGA driver: \_\_\_\_\_

**OMEGA Backlighter:**

Pulse shape: \_\_\_\_\_ Energy: \_\_\_\_\_ Drivers: \_\_\_\_\_

Beams: \_\_\_\_\_

DPP's: \_\_\_\_\_

Target positioner: \_\_\_\_\_

**OMEGA EP:**

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

**Primary Diagnostic Configuration:**

TIM based: \_\_\_\_\_

Fixed: \_\_\_\_\_

New (please describe): \_\_\_\_\_

\_\_\_\_\_

**Appendix D – Three-Page Summary for the Proposed Experiment**  
**OMEGA/OMEGA EP Laboratory Basic Science Proposal – FY21**

*FY21*

*OMEGA/OMEGA EP*

**Proposed campaign/experiment name:**

- **Purpose/goal:**
  - To measure
- **Specific deliverable(s) of this campaign (in FY21):**
  - To measure
- **What would we do with results:**
  - Compare with
- **PI/Designer:**
  -
- **Technical issues (e.g., target design/fab, diagnostics, reconfiguration, etc.):**

*FY21*

*OMEGA/OMEGA EP*

**Proposed campaign/experiment name:**

**VISRAD model configuration or schematic for the proposed experiments**

**Proposed campaign/experiment name:**

**Experimental configuration**

**Number of shots or days required:**

**Schedule request (by quarter, FY21):**

(If your proposal is selected for a beam time award and the PI could be ready for shots in Q1FY21, please specify.)

**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:**

*DT or DD, Special Fills, Planar Cryo*

*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)**