

**U. S. DEPARTMENT OF ENERGY, OFFICE OF SCIENCE
INTEGRATED SUPPORT CENTER—CHICAGO OFFICE**

**NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
ENVIRONMENTAL EVALUATION NOTIFICATION FORM**

To be completed by "Applicant," i.e., organization with responsibilities for a "Federal action" involving application to DOE for a permit, license, exemption or allocation, or other similar actions. For assistance with this Form, refer to "Instructions for Preparing ISC-CH F-560, Environmental Evaluation Notification Form."

Solicitation/Award No. (if applicable): DE-SC0022832

Organization Name:

Luna Innovations Incorporated

Proposed Action Title:

Scaled Reduced Mode Sapphire Fiber Production Towards High Temperature Radiation Resilient Sensors

Total DOE Funding/Total Funding: \$199,998

I. Project Description: (Use explanation pages if additional space is required)

A. Proposed Project/Action (if applicable, delineate Federally funded/Non-Federally funded portions)

The project will irradiate at MIT Nuclear Reactor Laboratory (MIT-NRL) in the Silicon Program's through ports for Neutron Transmutation Doping (NTD) multi mode sapphire fiber with a Li6 annulus surrounding the fiber. The neutron irradiation process allows for the reaction: Li6 (n,alpha) H3. Via this process the multi mode fiber is transformed to single mode. The fiber is then removed for various additional processes to produce high temperature sensors. At this point the fiber may contain small (below the NRC license threshold) amounts of tritium. Post irradiation processing and testing will occur at OSU.

B. Would the project proceed without Federal funding?

Yes

No

If "yes," use explanation page.

II. Description of Affected Environment: (Use explanation pages if additional space is required)

The material will be processed at the MIT Nuclear Reactor Laboratory. During processing, small amounts of tritium will be produced. The tritium production is within the MIT Nuclear Reactor Laboratory's license limit, and has been approved by the MIT Nuclear Reactor Laboratory. After an initial cool down period MIT-NRL will dispose of the material in accordance with their U.S. Nuclear Regulatory Commission license (cost of \$180). Approximately three appropriately trained MIT-NRL personnel will handle material insertion and removal from the reactor facility and irradiated canisters. All radiological activity will be conducted according to 29 CFR 1910.97 and 29 CFR 1910.1096. Once processed at MIT-NRL, the reduced mode sapphire fiber will be cleaned shipped to The Ohio State University (OSU) for evaluation. The fiber has the potential to contain a small amount of tritium within it. Though this is below what would require licensing as a radiation source, OSU's radiation safety office tracks and monitors the testing and processing of these fibers at OSU's laboratory.

III. Preliminary Questions:

- | | Yes | No |
|---|--------------------------|-------------------------------------|
| A. <u>Is the DOE-funded work routinely administrative or <i>entirely</i> advisory or a “paper study?”</u> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

If “Yes”, ensure that the description in Section I reflects this and go directly to Section V.

- B. Is there any potential whatsoever for: (*Provide an explanation for each “Yes” response*)

- | | | |
|--|-------------------------------------|-------------------------------------|
| 1. Work to be performed outdoors? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2. Major modification of a building interior? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3. Threat of violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4. Siting, construction or major expansion of waste treatment, storage, or disposal facilities? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5. Disturbance to hazardous substances, pollutants, or contaminants preexisting in the environment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 6. The presence of any environmentally-sensitive resources? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 7. Any potential whatsoever for high consequence impacts to human health or the environment? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 8. The work being connected to another existing/proposed activity that could potentially create a significant impact? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9. Nearby past, present, and/or reasonably foreseeable future actions such that collectively significant impacts could result? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 10. Scientific or public controversy, uncertainty over potential impacts, or conflicts regarding resource usage? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

If “No” to ALL Section III.B. questions, go directly to Section V.

IV. Potential Environmental Effects: (*Provide an explanation for each “Yes” response*)

- A. Environmentally Sensitive Resources: Could the proposed action potentially result in changes and/or disturbances to any of the following resources?

- | | Yes | No |
|--|--------------------------|-------------------------------------|
| 1. Threatened/Endangered Species and/or Critical Habitats | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2. Other Protected Species (e.g., Burros, Migratory Birds, Pollinators) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3. Sensitive Environments (e.g., Tundra/Coral Reefs/Rain Forests) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4. Cultural or Historic Resources | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 5. Important Farmland | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 6. Non-Attainment Areas for Ambient Air Quality Standards | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 7. Class I Air Quality Control Region | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 8. Special Sources of Groundwater (e.g. Sole Source Aquifer) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9. Navigable Air Space | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 10. Coastal Zones | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11. Areas with Special National Designation (e.g. National Forests, Parks, Trails) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 12. Floodplains and/or Wetlands | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

- B. Regulated Substances/Activities: Would the proposed action involve any of the following regulated Items or activities?

- | | | |
|--|--------------------------|-------------------------------------|
| 13. Natural Resource Damage Assessments | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 14. Invasive Species or Exotic Organisms | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 15. Noxious Weeds | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 16. Clearing or Excavation greater than one acre or Removal of Trees Governed by Local Requirement | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 17. Dredge or Fill (under Clean Water Act, Section 404, greater than one acre) | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

B. Regulated Substances/Activities: Would the proposed action involve any of the following regulated Items or activities? (continued)

	Yes	No
18. Noise (in excess of regulations)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
19. Asbestos Removal	<input type="checkbox"/>	<input checked="" type="checkbox"/>
20. Polychlorinated biphenyls (PCBs)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
21. Import, Manufacture, or Processing of Toxic Substances	<input type="checkbox"/>	<input checked="" type="checkbox"/>
22. Chemical Storage/Use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
23. Pesticide Use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
24. Hazardous, Toxic, or Criteria Pollutant Air Emissions	<input type="checkbox"/>	<input checked="" type="checkbox"/>
25. Liquid Effluents	<input type="checkbox"/>	<input checked="" type="checkbox"/>
26. Spill Prevention/Surface Water Protection	<input type="checkbox"/>	<input checked="" type="checkbox"/>
27. Underground Injection	<input type="checkbox"/>	<input checked="" type="checkbox"/>
28. Hazardous Waste	<input type="checkbox"/>	<input checked="" type="checkbox"/>
29. Underground Storage Tanks	<input type="checkbox"/>	<input checked="" type="checkbox"/>
30. Radioactive or Radioactive Mixed Waste	<input checked="" type="checkbox"/>	<input type="checkbox"/>
31. Radiation Exposure	<input checked="" type="checkbox"/>	<input type="checkbox"/>
32. Nanoscale Materials	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33. Genetically Engineered Microorganisms/Plants or Synthetic Biology	<input type="checkbox"/>	<input checked="" type="checkbox"/>
34. Ozone Depleting Substances	<input type="checkbox"/>	<input checked="" type="checkbox"/>
35. Greenhouse Gas Generation/Sustainability	<input type="checkbox"/>	<input checked="" type="checkbox"/>
36. Off-Road Vehicles	<input type="checkbox"/>	<input checked="" type="checkbox"/>
37. Biosafety Level 3-4 Laboratory	<input type="checkbox"/>	<input checked="" type="checkbox"/>
38. Research on Human Subjects or other Vertebrate Animals	<input type="checkbox"/>	<input checked="" type="checkbox"/>
39. Facility footprint exceeds 5,000 Square Feet	<input type="checkbox"/>	<input checked="" type="checkbox"/>

C. Other Relevant Information: Would the proposed action involve the following?

	Yes	No
40. Disproportionate Nearby Presence of Minority and/or Low Income Populations	<input type="checkbox"/>	<input checked="" type="checkbox"/>
41. Existing, Modified, or New Federal/State Permits	<input checked="" type="checkbox"/>	<input type="checkbox"/>
42. Involvement of Another Federal Agency (e.g. license/permit, funding, approval)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
43. Action in a State with NEPA-type law	<input type="checkbox"/>	<input checked="" type="checkbox"/>
44. Expansion of Public Utilities/Services	<input type="checkbox"/>	<input checked="" type="checkbox"/>
45. Depletion of a Non-Renewable Resources	<input type="checkbox"/>	<input checked="" type="checkbox"/>
46. Subject to an Existing Institutional Work Planning and Control Process	<input type="checkbox"/>	<input checked="" type="checkbox"/>
47. Other Pertinent Information Which Could Impact Human Health or the Environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>

V. Applicant certification that to the best of their knowledge all information provided on this form is accurate:

Does this disclosure contain: classified, sensitive business, or other exempt information that DOE would not be obligated to disclose pursuant to the Freedom of Information Act. Yes No

A. Organization Official (Name and Title): Mary (Maggie) Hudson, Senior Contracts Administrator

Signature:  Date: 07/22/2022

e-mail: Maggie.Hudson@LunaLabs.us Phone: (434) 220-1559

B. Optional Secondary Approval (Name and Title): Derek Rountree

Signature:  Date: 07/22/2022

e-mail: rountreed@lunainc.com Phone: (540) 558-1667

Remainder to be completed by DOE

VI. DOE Concurrence/Recommendation/Determination:

A. DOE Project Director/Program Manager or Contract/Grant Management Specialist:

	Yes	No
Has the Applicant completed this Form correctly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Does an existing generic categorical exclusion apply?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If yes, indicate: _____

Name and Title: Bart Malewski, Contract Specialist

Signature: BARTLOMIEJ MALEWSKI Digitally signed by BARTLOMIEJ MALEWSKI
Date: 2022.08.02 17:04:00 -05'00' Date: _____

B. DOE NEPA Team Review (if requested):

	Yes	No
Is the class of action identified in the DOE NEPA Regulations (Appendices A-D to Subpart D (10 CFR § 1021))?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

If yes, specify the class(es) of action: B3.6, B3.10

Name and Title: _____

Signature: _____ Date: _____

C. DOE Counsel (if requested):

Name and Title: _____

Signature: _____ Date: _____

D. DOE NEPA Compliance Officer:

The preceding pages are a record of documentation required under DOE Final NEPA Regulation, 10 CFR § 1021.410.

- Action may be categorically excluded from further NEPA review. I have determined that the proposed action meets the requirements for Categorical Exclusion referenced above.
- Action requires approval by Head of the Field Organization. Recommend preparation of an Environmental Assessment.
- Action requires approval by Head of the Field Organization or a Secretarial Officer. Recommend preparation of an Environmental Impact Statement.

Comments/limitations if any:

NEPA Compliance Officer:

Name: PETER SIEBACH Digitally signed by PETER SIEBACH
Date: 2022.08.03 13:11:41 -05'00'

Signature: _____ Date: _____

Optional Additional Narrative: (add additional detail to description to Sections I and II or explanations to responses in Sections III and IV.

Once processed at MIT-NRL, the reduced mode sapphire fiber will be cleaned shipped to The Ohio State University (OSU) for evaluation. The fiber has the potential to contain a small amount of tritium within it. Though this is below what would require licensing as a radiation source, OSU's radiation safety office tracks and monitors the testing and processing of these fibers at OSU's laboratory. Each fiber will have less than 0.8 mCi of tritium, which is below the 1 mCi limit of NRC 30.71 Schedule B, so no license is required to possess each fiber. The number of fibers produced will be approximately 15 (less than 20). The conglomerate of these fibers will contain no more than 16 mCi of tritium, resulting in a total tritium content in the OSU lab of approximately 26 mCi, well below the labs limit of 100mCi.

During the work at MIT-NRL for the DOE award to Luna it is expected that MIT-NRL's radiation workers will be exposed to less than 50 mR, far less than the allowable 5 R, production of tritium will be assed and will be included in MIT's tritium production budget, and low level waste will be disposed of via MIT-NRL's disposal procedures in accordance with the MIT-NRL's NRC license and the MIT-NRL ALARA Program.

Current license/permit associated with the project:

The MIT reactor is a tank-type research reactor. It is owned and operated by the Massachusetts Institute of Technology, a non-profit educational institution, and is licensed by the US Nuclear Regulatory Commission. Its current license, issued in November 2012, authorizes steady-state 6 MW operation for 20 years.

