Project Introduction

Atomic layer deposited functional nano-film technology is used to manufacture Microchannel plate (MCP) devices capable of high gain / low ion feedback operation, on glass capillary array substrates, as a means to replace MCP chevron configuration and enable direct photocathode deposition (e.g. GaN) for NASA applications. Commercial MCP devices rely on 1970's manufacturing technology, constrained by the bulk glass: heavy metal impurities limit the achievable dark noise in low signal detection, the requisite batch processing restricts flexibility to tailor individual device performance and often result in poor yield. Arradiance's proven nano-film technology has been shown in Phase I to improve the component functions of secondary electron emission and conductivity resulting in high performance MCPs. In Phase II performance optimization of these novel devices and, enabled by substrate independence, an opportunity to explore direct deposition of advanced photocathodes. Since the high quality GaN films required for efficient photoelectron transport can only be deposited at elevated temperatures (<900 C), conventional Pb-glass MCPs, with a softening point of ~400C, are not suitable. Arradiance nanofilms allow high temperature MCP substrates (e.g. quartz or anodized alumina - AAO) and the opportunity for significant detection efficiency improvement. TRL 4 at beginning; TRL 6 at end.

Anticipated Benefits


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## Primary U.S. Work Locations and Key Partners

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<th>Organizations Performing Work</th>
<th>Role</th>
<th>Type</th>
<th>Location</th>
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<tr>
<td>Goddard Space Flight Center (GSFC)</td>
<td>Lead Organization</td>
<td>NASA Center</td>
<td>Greenbelt, MD</td>
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<tr>
<td>Arradiance, Inc.</td>
<td>Supporting Organization</td>
<td>Industry</td>
<td>Sudbury, MA</td>
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<td>Jet Propulsion Laboratory (JPL)</td>
<td>Supporting Organization</td>
<td>NASA Center</td>
<td>Pasadena, CA</td>
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<tr>
<td>Marshall Space Flight Center (MSFC)</td>
<td>Supporting Organization</td>
<td>NASA Center</td>
<td>Huntsville, AL</td>
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### Organizational Responsibility

**Responsible Mission Directorate:**
Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**
Goddard Space Flight Center (GSFC)

**Responsible Program:**
SBIR/STTR

### Project Management

**Program Director:**
Jennifer L Gustetic

**Program Manager:**
Carlos Torrez

**Project Managers:**
Gary Jahns
Betsy Pugel

**Principal Investigator:**
Neal Sullivan

## Primary U.S. Work Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>State</th>
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<tbody>
<tr>
<td>Alabama</td>
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<td>Massachusetts</td>
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<td>Maryland</td>
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SBIR/STTR
Functionalized Nano-Film Microchannel Plate: A Single High Aspect Ratio Device for High Resolution, Low Noise Astronomical Imaging, Phase II
Completed Technology Project (2011 - 2013)

Closeout Documentation
Final Summary Chart
(https://techport.nasa.gov/file/15917)

Technology Maturity (TRL)
Start: 4
Current: 2
Estimated End: 6

- 1: Applied Research
- 2: Development
- 3: Demo & Test

For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/9478