High-Efficiency Ion Source
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SUMMARY
UCLA researchers in the Department of Mechanical and Aerospace Engineering have developed a miniature direct-current (DC) ion source with the higher power efficiencies and lower erosion rates needed for space propulsion applications.

BACKGROUND
Miniature ion thrusters are a key enabling technology for microsatellites and larger satellites in space missions. Recent miniature spacecraft technologies have increased delivery capabilities by microsatellites and therefore there is an increasing need for efficient miniature ion thrusters. Conventional scale ion thrusters have already demonstrated efficiencies of >80%, but miniature ion thrusters have yet to approach the same performance due to their increased discharge loss. While miniature RF ion thrusters have gained popularity over the past decade, higher power efficiencies and lower erosion rates are needed for space propulsion applications.

INNOVATION
Researchers at UCLA have developed a miniature direct-current (DC) ion source that utilizes a magnetic field design to significantly increase the discharge and mass utilization efficiency above the state of the art. The higher efficiency results in lower production of doubly charged ions, less erosion and contamination, and higher beam densities. In addition, the proposed design is scalable to lower and higher powers. In comparison to other miniature ion thrusters, this design increases propellant efficiency by 10%. By reducing the power consumption and inert mass of the propulsion system, this invention can enable missions for microsatellites or smaller craft that were once not achievable.

APPLICATIONS
- Miniature ion thruster source for space propulsion
- Ion beam etching with plasma processing, particularly in nano-fabrication

ADVANTAGES
- Discharge and mass utilization efficiency above the state of the art
- Reduced erosion, higher beam densities
- Highly scalable to lower and higher powers
- Increases propellant efficiency by 10% in comparison to other miniature ion thrusters

RELATED MATERIALS
- Patent Application (WO2018112184A1)

PATENT STATUS
Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
- Design for Viable Integrated Wind Turbines
- Multi-Point, Multi-Access Energy Storage
- Low-Intrusion Plasma Probe
- Plasma-Functionalized Bandpass Switch