



Call For Abstracts

Abstracts Due 13 May 2022

**ADVANCED
POWER SYSTEMS
FOR DEEP SPACE EXPLORATION
2022** Virtual
30 Aug - 1 Sep



ADVANCED POWER SYSTEMS FOR DEEP SPACE EXPLORATION 2022 Virtual 30 Aug - 1 Sep

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Join Us

Despite challenges here on Earth over the last several years, solar system exploration continues at a rapid pace. A new radioisotope-powered rover has landed on Mars and is exploring the Jezero crater region. Along for the ride was the first helicopter to fly on another planet, with another rotorcraft in the works to explore Titan. Missions are fanning out across the solar system, to explore a variety of different asteroids including Lucy and OSIRIS-Rex, with Psyche slated to launch later this year. NASA's first planetary defense mission (DART) is now on its way to deflect the motion of an asteroid. The James Webb Space Telescope was successfully launched and deployed, which will allow observations of objects orders of magnitude fainter than its predecessor could detect. Looking toward the future, plans are underway to return to Earth the first samples collected from the surface of Mars. After a relatively slow period of Venus exploration for the last several decades, there are plans to return to this fascinating planet with missions such as DAVINCI+ and VERITAS. Even closer to home, an armada of landers and rovers is set to descend upon the lunar surface in the near future. Some of them are being developed by commercial providers, to expand our knowledge of our closest neighbor and shed light on the permanently shadowed regions of the moon. There are even plans to follow these lunar robotic visitors with human explorers in the coming decade. In every single case, a reliable power system is critical to mission success.

Now in its third year, the 2022 Conference on Advanced Power Systems for Deep Space Exploration (APS⁴DS) will again include all topics related to power for deep space missions to the Moon and beyond. **We invite you to submit an abstract that discusses the leading-edge technology or research your organization is working on, as well as engage your organization through sponsorship of this key technology conference.** Submittals for full talks will be accepted for the topics listed on the following pages.

Abstract Submission Process

We look forward to receiving your abstract(s) for the 2022 APS⁴DS Conference via online submission at:

<https://www.usasymposium.com/deepspace/cfa.php>. There is a downloadable template available on the submission page that may be used to format your abstract. Abstracts must be unclassified and contain only public releasable information. The conference is held at the full and open level and it is the responsibility of all authors to ensure the materials they submit and/or present conform to security classification guides, if applicable. Be sure to include the title of your abstract in the body of the submission (this does not count against the 400 word count.) All abstracts should fall into one or more of the described topics on the following pages. For questions concerning submission of your abstract, please contact Sherry Johnson at sjohnson@blue52productions.com, 937-554-4671.

In early June, you will be contacted regarding the status of your acceptance. Final presentations will be due 1 August 2022. Digital proceedings will be published for this event and available to attendees for a small fee. Please note that all attendees, including speakers, pay the same registration fee.

Technical Advisory Committee:

- › Erik Brandon (JPL) (Chair)
- › Sabah Bux (JPL)
- › Greg Carr (JPL)
- › Brianne DeMattia (NASA GRC)
- › Wesley Fuhrman (JHU APL)
- › Brent Gardner (NASA GRC)
- › Jonathan Grandidier (JPL)
- › Chris Iannello (NESC)
- › Vladimir Jovovic (JPL)
- › Jeremiah McNatt (NASA GRC)
- › Paul Ostdiek (JHU APL)
- › Joel Schwartz (JPL)
- › Will West (JPL)

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TOPIC AREAS

Topic 1: Power Systems and Architectures

This topic addresses the overall power systems and architectures for small and large spacecraft, as well as surface power architectures.

- » Power management and distribution for deep space orbiters, fly-by missions landers and probes
- » Design and analysis of high reliability power systems across all mission classes (from CubeSats and SmallSats to flagship missions)
- » Power system designs for current and planned deep space missions, and new mission concepts
- » Power regulation and load leveling of spacecraft power buses
- » Distributed and point of load conversion architectures
- » Approaches to fault tolerance in power systems and lessons learned from power anomalies
- » High voltage, high power architectures
- » Electric propulsion power architectures
- » Lunar power architectures (Gateway, surface power, in situ resource utilization)

Topic 2: Power Conversion, Switching and Transfer

This topic addresses power electronics, particularly the areas of power switching and conversion.

- » High efficiency dc-dc converters and power switches
- » Design, reliability, and radiation effects for wide-bandgap semiconductors
- » Digital control for spacecraft applications
- » High voltage for spacecraft bus, instrumentation, and electric propulsion Power Processing Units (PPU)
- » Reliability and radiation effects in EEE, COTS, and automotive components
- » 3D and advanced packaging techniques for spacecraft applications
- » Radiation-hardened controller IC development
- » Distribution and cabling design and testing
- » Tethered power transfer technologies

Topic 3: Power Sources

This topic addresses current power source technologies, and development of advanced technologies.

- » Space solar cell and solar array designs and development
- » Advanced solar cell designs and technologies (multi-junction, III-V, II-VI materials)
- » Advanced solar cell materials development (perovskites, etc.)
- » Low irradiance/low temperature (LILT) solar array designs
- » Solar array modeling and testing
- » Solar concentrator designs
- » Thin film photovoltaics
- » Rigid deployable and lightweight solar array structures
- » Thermoelectric materials and device development
- » Thermoelectric converter/generator technology and testing
- » Radioisotope thermoelectric generator testing and operations
- » New and modified radioisotope heat sources
- » Dynamic conversion system development and testing (Stirling, Brayton)
- » Fission power systems and technologies
- » Compact, long life power sources (radioisotope based, alpha-voltaics, beta-voltaics)
- » Advancements in space power energy conversion technologies

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Topic 4: Energy Storage

This topic addresses energy storage for primary power and rechargeable systems for load leveling/peak power/eclipse requirements.

- » Primary cell chemistries (Li/SO₂, Li/SOCl₂, Li/MnO₂, Li/CFx and Li/CFx-MnO₂)
- » Primary battery/module design
- » Thermal batteries
- » COTS and custom battery cell selection, testing and space qualification
- » Rechargeable cell chemistries (Li-ion) for space
- » Li-ion battery pack design
- » Safe, high reliability, thermal propagation resistant battery module development
- » High specific energy/high power "Beyond Li" battery technologies
- » Low temperature or high temperature-capable Li-ion cells
- » Additively manufactured batteries
- » Battery performance, state-of-charge determination and lifetime modeling
- » Supercapacitors (electrochemical double-layer capacitors, asymmetric capacitors, Li ion capacitors)
- » Primary and regenerative fuel cells (PEM, SOFC)
- » Flywheels

Topic 5: Power Systems, Sub-Systems and Components for Operation in Extreme Environments

This topic encompasses all aspects of power systems and technologies as they relate to the unique challenges of the deep space environment.

- » Design and development of power components and technologies for extreme environments
- » Wide temperature operation
- » High temperature Venus aerial and surface exploration
- » High radiation environments
- » Low irradiance/low temperature deep space conditions
- » Design for long life/high reliability in deep space environment
- » Evaluation of radiation on power components and sub-systems
- » Power technologies for Ocean Worlds exploration and sub-surface access/exploration

Topic 6: Advanced Power Concepts

This topic focuses on advanced/emerging concepts in power technologies for deep space applications.

- » Novel energy harvesting concepts and designs (piezoelectric, magnetic fields, etc.)
- » Fusion power systems
- » Thermionic and thermophotovoltaic technologies
- » Alkali-metal thermoelectric converter (AMTEC) technology
- » Power beaming
- » In situ derived energy and power sources
- » Wind power for Venus exploration
- » Combined chemical heat/power sources

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