



Call for Abstracts

DUE: 15 APRIL 2020

2020

Conference on Advanced
Power Systems for

**DEEP SPACE
EXPLORATION**

27 – 29 October • Pasadena, CA

**Abstract Due Date:
15 April 2020**

Join Us

Exploration of the solar system is entering its seventh decade. Along the way, innovations in power systems have played a critical role in expanding this exploration campaign, which now features missions to Kuiper Belt objects and interstellar space. The key role of power systems is evidenced by the Voyager spacecraft, that still operates on radioisotope thermoelectric generators after more than 40 years in space. The Juno mission is utilizing the largest area solar array ever flown into deep space, operating at the farthest distance an array has ever powered a spacecraft.

Innovation continues to drive an ever growing list of mission enhancing and mission enabling technologies for deep space exploration, including higher efficiency power electronics, low irradiance/low temperature solar cells, radioisotope and fission power systems, and advanced energy storage technologies. Exciting new missions driven by these innovations are on the horizon, including sample return missions, powered flight on Mars and Titan, exploration of the ocean worlds, missions to the ice giants, and plans to return to the Moon. Advanced mission concepts such as in situ resource utilization, power beaming, climbing robots, landers surviving the lunar night and sub-surface access/exploration on ocean worlds will all depend on more capable power systems in the coming decades.

The 2020 Conference on Advanced Power Systems for Deep Space Exploration (APS⁴DS), at the Westin Pasadena, will pick up where the 2018 conference left off, and look again to the future of deep space power systems. The agenda for this conference will 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 both full talks and posters will be accepted for the topics listed on the following pages.

Travel Restrictions & Approval

For those working for government agencies, you are encouraged to submit your travel requests now. Though travel restrictions for many government agencies are loosening, some still require many months advance notice for conference travel. Because of this, we encourage you to get your paperwork submitted ASAP and contact us if you need any additional information or justification.

Conference Security

This conference is held at the unclassified, full and open level.

Technical Advisors for this Event Include:

- Erik Brandon (JPL), Chair
- Ansel Barchowsky (JPL)
- Andreea Boca (JPL)
- Sabah Bux (JPL)
- Terry Hendricks (JPL)
- Dionne Hernandez-Lugo (NASA GRC)
- Chris Iannello (NASA NESG)
- Jeremiah McNatt (NASA GRC)
- Paul Ostdiek (JHU/APL)
- William West (JPL)
- David Woerner (JPL)
- James Wu (NASA GRC)

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TOPIC AREAS

Topic 1: Power Systems and New Power System 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
- High voltage, high power architectures
- Solar electric propulsion architectures
- Lunar power architectures (Gateway, surface power, in situ resource utilization)

Topic 2: Power Conversion and Power Switching Electronics

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

Topic 3: Power Sources

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

- 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)

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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
- › 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 aspect of power systems and technologies as relates to the unique challenges of the deep space environment.

- › Design and development of power components and technologies for extreme environments
- › Wide temperature operation
- › 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
- › Combined chemical heat/power sources

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Poster Session Participation

Consider submitting one or more abstracts for the poster session in order to take advantage of your time at the event. Even if you give an oral presentation, you can increase your exposure by presenting a poster as well. The poster session is an important alternative way to present the results of your research and technology, and in some cases, is a more effective way to present your material.

Abstract Submission Process

We look forward to receiving your abstract(s) for the 2020 Advanced Power Systems for Deep Space Exploration 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 previous pages. For questions concerning submission of your abstract, please contact Sherry Johnson at sjohnson@blue52productions.com, 937-554-4671.

In early May 2020, you will be contacted regarding the status of your acceptance. PLEASE DO NOT WAIT FOR NOTIFICATION ACCEPTANCE TO SUBMIT A TRAVEL APPROVAL REQUEST WITHIN YOUR ORGANIZATION. START THAT PROCESS NOW. Presentation of an abstract does not waive any applicable registration fees.

Final presentations will be due 29 September 2020. Proceedings will be published for the event and will include presentations and some papers. Papers are encouraged, but are not required for this event. Please note that presentations and papers may not contain proprietary information.

Submission Site: <https://www.usasymposium.com/deepspace/cfa.php>

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