



## Sensors and Systems for Space Applications XV (SI219)

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Space systems include launches, payload adapters, on-orbit systems, communications links, ground systems, and user equipment. The effects of space weather and orbital debris, the increase in space launch capabilities within the developing world, and the halt of manned space flight, have increased the demand for contextual understanding of future challenges and possibilities of space systems. Developments in small satellites and constellation technologies, coupled with more affordable launch services such as the pioneering Space X enterprise, may vastly transform knowledge discovery, economic prosperity, and national security of space. Sustained excellence in space environments, space communications and navigation technologies, advanced space resilient technologies, and awareness and command and control are vital to the future conduct of space policies and operations. Therefore, research and development, from operational concepts to subsystems and component level innovations, covering all aspects of the design process, end-user requirements, and how such requirements would affect design and operational decisions is needed. This conference will host a wide array of scientific and defense-related topics to foster multidisciplinary discussions that allow participants to gain an understanding of the technological issues being addressed by their counterparts, such as: i) sensors and sensor control for resilient space operations; ii) remote sensing and space control for space domain awareness, and space command and control autonomy; iii) space assured access and security from unauthorized access and manipulation for highly integrated, federated, and orchestrated space networks; iv) trustworthy autonomous networks to provide 5G/6G services in space and data transport; v) optical and quantum information technologies for precise time transfer and synchronization with resilient positioning, navigation, and timing; and vi) emergent technologies for artificial intelligence (AI), counter-AI, machine learning, and digital twins, for collaborative navigation and global navigation satellite systems (GNSS) integrity monitoring.

This conference captures the uses and issues for both civil and military space systems and provides a forum for cross-fertilization between international civil space, military space, and the intelligence community. Papers are solicited on the following and related topics:

### SENSORS AND SENSOR CONTROL

- sensors and systems for space domain awareness
- color photometry of multiple resident space objects
- dual-use subsystems such as sensors used for communications purposes
- active illumination for non-imaging optical sensors
- indication and warning data fusion and decision support
- innovative tasking and dissemination architectures
- missile defense sensors and applications
- small-sat, micro-sat, and nano-sat technologies
- micro-services architecture for space sensing systems.

### REMOTE SENSING AND SPACE CONTROL

- mitigation of space environment effects, such as radiation hardening
- optical contamination detection, abatement, effects, and response
- change detection
- closely spaced object determination
- resident space object track association, trajectory inference, and prediction
- persistent monitoring for time sensitive and critical engagement.

### ASSURED ACCESS AND SECURITY IN SPACE

- high assurance internet protocol encryption
- robust and secure machine learning
- security, privacy, and trust in edge-fog-cloud computing based space systems
- blockchain enabled decentralized security solutions
- information priority and scheduling
- information interoperability
- 5G/6G cybersecurity and resilience.

**TRUSTWORTHY AUTONOMOUS NETWORKS**

- radio access network slicing
- network coding and topology inference
- secure and dependable software-defined networking
- machine learning and artificial intelligence for content analysis and stream recognition
- multi-tenant edge computing in space and ground support networks
- 5G/6G space to ground networks
- 5G/6G cloud-based network slide orchestration

**OPTICAL AND QUANTUM INFORMATION TECHNOLOGIES**

- visible light communications
- modeling, simulation, and analysis of time transfers in optical crosslinks
- distributed time synchronization in optical crosslink satellite constellations
- quantum networks of clocks
- quantum communications.

**EMERGING TECHNOLOGIES**

- 3D Printing/ Additive manufacturing for 5G Multiple-Input and Multiple-Output (MIMO) and space applications
- Virtual reality (VR)/ AR (augmented reality) for space applications
- AI, Counter-AI, Machine Learning, Adversarial Learning for space applications
- Digital Twin technology for collaborative navigation and GNSS integrity monitoring.

**BEST PAPER AWARDS**

We are pleased to announce Best Paper Awards in Sensors and Systems, sponsored by Intelligent Fusion Technology, Inc., will be awarded to the best paper and best student paper in Sensors and Systems for Space Applications. Qualifying papers will be evaluated by the awards committee. Manuscripts will be judged based on scientific merit, impact, and clarity. The winners will be announced during the conference and the presenting authors will be awarded a cash prize.

**To be eligible for the Best Paper Award, you must:**

- be listed as an author on an accepted paper within this conference
- have conducted the majority of the work to be presented
- submit your manuscript online by 9 March 2022
- present your paper as scheduled

**To be eligible for the Best Student Paper Award, you must:**

- be a student without a doctoral degree (undergraduate, graduate, or PhD student)
- submit your abstract online, and select "Yes" when asked if you are a full-time student, and select yourself as the speaker
- be the presenting author on an accepted paper within this conference
- have conducted the majority of the work to be presented
- submit your manuscript online by 9 March 2022
- present your paper as scheduled

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## ABSTRACT SUBMISSION GUIDELINES

### Important dates

Abstract submission deadline	6 October 2021
Author notification	3 December 2021
Submission system opens for presentations and manuscripts*	31 January 2022
Manuscript due	9 March 2022
Oral presentation videos due	9 March 2022
Poster PDF and preview videos due	9 March 2022
Oral presentation slide deadline	1 April 2022

\*Authors must register prior to uploading.

### What you will need to submit

- Title
- Author(s) information
- 250-word abstract for technical review
- 100-word summary for the program
- Keywords used in search for your paper (optional)
- Check the individual conference Call for Papers for additional requirements (for example, some conferences require 2- to 3-page extended summary for technical review, or have instructions for award competitions)

Note: Only original material should be submitted. Commercial papers, papers with no new research/development content, and papers with proprietary restrictions will not be accepted for presentation.

### How to submit your abstract

- Visit the conference page: [www.spie.org/SI219call](http://www.spie.org/SI219call)
- You may submit more than one abstract but submit each abstract only once.
- Click the "Submit An Abstract" button on the conference page.
- Sign in to your SPIE account or create an account if you do not already have one.
- Follow the steps in the submission wizard until the submission process is completed.

### Submission agreement

All presenting authors, including keynote, invited, oral, and poster presenters, agree to the following conditions by submitting an abstract:

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- Ensure that all clearances, including government and company clearance, have been obtained to present and publish. If you are a DoD contractor in the USA, allow at least 60 days for clearance.
- Attend the meeting.
- Present at the scheduled time.

### Review and program placement

- To ensure a high-quality conference, all submissions will be assessed by the Conference Chair/Editor for technical merit and suitability of content.
- Conference Chairs/Editors reserve the right to reject for presentation any paper that does not meet content or presentation expectations.
- Final placement in an oral or poster session is subject to chair discretion.

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