

CALL FOR PAPERS - SPECIAL SESSION
“Optimization and control for fusion plasmas”
for **CODIT 2024**
July 01-04, 2023 ▪ **Valletta, Malta**

Session Co-Chairs:

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Session description:

This special session deals with the problem of plasma control in nuclear fusion reactors. Nuclear fusion represents a promising solution for the production of clean, fossil-free energy. It has seen a revived interest in the last years, thanks to a number of scientific milestones that have been recently achieved. These include the first scientific breakeven at the Lawrence Livermore National Laboratory, the energy production record of the last Deuterium-Tritium campaign of the Joint European Torus, and the first plasma of the JT-60SA superconductive device in Japan, which in December 2023 became officially the largest operating tokamak in the world.

Nuclear fusion reactors, however, are also a fantastic playground which offers a variety of control problems. PDE-governed systems, Multi-Input-Multi-Output control problems, plasma scenario optimization techniques, shared actuators and consequent actuators management/allocation problems, supervisory and protection systems are only a few of the issues that need to be addressed for the successful operation of these devices.

Moreover, along the traditional model-based approaches, a new trend has emerged towards the use of Machine Learning and Data-Driven techniques, pushing the boundary of what can be achieved in terms of confinement performance and plasma parameters.

The goal of this session is to present some recent advancements in the field of fusion plasma control.

The topics of interest include, but are not limited to:

- Model-based control techniques (e.g. magnetic control, MPC)
- Optimization problems (e.g. scenario design in tokamaks or stellarators)
- PDE control problems in fusion plasmas (e.g. 1D profile control)
- ML and data-driven approaches (e.g. reinforcement learning control techniques, neural surrogate models)
- Supervisory and protection systems (e.g. proximity control)

Prior sessions on Control of Tokamak Plasmas and related topics were held at the following conferences:

- 36th IEEE Conference on Decision and Control in San Diego, CA, USA (1997)
- IEEE Conference on Control Applications in Anchorage, AK, USA (2000)
- 42nd IEEE Conference on Decision and Control in Maui, HI, USA (2003)
- 45th IEEE Conference on Decision and Control in San Diego, CA, USA (2006)
- 47th IEEE Conference on Decision and Control in Cancun, Mexico (2008)
- 48th IEEE Conference on Decision and Control in Shanghai, China (2009)
- IEEE Multi-Conference on Systems and Control in Denver, Colorado (2011)
- 50th IEEE Conference on Decision and Control in Orlando, FL, USA (2011)
- 51th IEEE Conference on Decision and Control in Maui, HI, USA (2012)
- IEEE Multi-Conference on Systems and Control in Sydney, Australia (2015)
- IEEE Multi-Conference on Systems and Control in Buenos Aires, Argentina (2016)
- 58th IEEE Conference on Decision and Control in Nice, France (2019)
- American Control Conference in Denver, CO, USA (2020) – Tutorial
- 6th IEEE Conference on Control Technology and Applications in Trieste, Italy (2022)
- SIAM Conference on Control and Its Application in Philadelphia, USA (2023)

SUBMISSION

Papers must be submitted electronically for peer review through PaperCept by **February 03, 2024**: <http://controls.paperccept.net/conferences/scripts/start.pl>. In PaperCept, click on the **CoDIT 2024 link** “Submit a Contribution to CoDIT 2024” and follow the steps.

IMPORTANT: All papers must be written in English and should describe original work. The length of the paper is limited to a maximum of 6 pages (in the standard IEEE conference double column format).

DEADLINES

February 03, 2024: deadline for paper submission

April 14, 2024: notification of acceptance/reject

May 10, 2024: deadline for final paper and registration