

DRF: Thesis SL-DRF-20-0687

RESEARCH FIELD

Data intelligence dont Intelligence Artificielle / Défis technologiques

TITLE

Artificial intelligence and fusion plasma control: Application to the WEST tokamak

ABSTRACT

Fusion energy is one of the most promising solutions for creating a carbon free civilization. To achieve this goal before the end of this century, the ITER project (www.iter.org), started at Cadarache in 2005, should demonstrate in the next decades the technical feasibility of controlled fusion reactions in a facility called a tokamak. One of the critical issues to reach this purpose is the efficient and robust control of the plasma (environment where the fusion reactions occur). The non-linearity, the uncertainties, and the weak observability of the plasma are currently what most limit exploration of the experimental domain via tuning of the control parameters using the time-consuming trial-and-error approach. In order to improve upon this, we propose to study the possible applications of the latest advances in artificial intelligence for the real-time fusion plasma control. The development will answer to the practical issues of WEST (Tungsten (W) Environment in Steady-state Tokamak, <http://irfm.cea.fr/en/west/>), an experimental facility primarily responsible for studying the operation of long-duration plasmas on metallic tokamaks. The applicant, after a bibliographical review on the subject, will investigate the control of the heavy impurities entering into the plasma. The aim is to advance the development of the control algorithms to the point that practical integration and tests on the WEST facility are successful. Collaboration is foreseen with the LCIS (Laboratory of System Conception and Integration - specialized in the control of complex systems) and with SPC (Swiss Plasma Center).

LOCATION

Institut de recherche sur la fusion par confinement magnétique
Service Tokamak Exploitation et Pilotage
Groupe Pilotage, Asservissements & Scénarios
Place: Cadarache
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FIND OUT MORE

<http://irfm.cea.fr/en/west/index.php>

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