Contribution ID: 22 Type: Oral

Validating and speeding up X-ray tomographic inversions in tokamak plasmas

Thursday, 15 June 2023 14:00 (40 minutes)

In tokamak plasmas, estimating the local impurity concentration can be subject to many uncertainties. In particular, it requires accurate knowledge of plasma temperature, magnetic equilibrium, impurity cooling factor and the spectral response of the diagnostics used. When all other plasma parameters are well-known, the impurity density profile can be reconstructed in the core with the help of X-ray tomography. In this contribution, we introduce some tools aiming at validating and speeding up the X-ray tomographic inversions. The traditional approach based on Tikhonov regularization, including magnetic equilibrium constraint and parameter optimization, is presented. The advantages and drawbacks of substituting it with neural networks for fast inversions are investigated. Finally, the perspectives for plasma profiles reconstruction and validation are discussed.

Acknowledgements. This work has been partially funded by the National Science Centre, Poland (NCN) grant HARMONIA 10 no. 2018/30/M/ST2/00799. We gratefully acknowledge Poland's high-performance computing infrastructure PLGrid (HPC Centers: ACK Cyfronet AGH) for providing computer facilities and support within computational grant no. PLG/2022/015994. This work has been published in the framework of the international project co-financed by the Polish Ministry of Education and Science, as program "PMW". This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 - EUROfusion). Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

Speaker's Affiliation

Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN), Krakow

Member State or IGO/NGO

Poland

Primary author: JARDIN, Axel (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN))

Co-authors: MAZON, Didier (CEA Cadarache); KROL, Krzysztof (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN)); BIELECKI, Jakub (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN)); PEYSSON, Yves (CEA Cadarache); SCHOLZ, Marek (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN)); WALKOWIAK, Jedrzej (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN)); GUIBERT, Denis (CEA Cadarache); DWORAK, Dominik (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN))

Presenter: JARDIN, Axel (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN))

Session Classification: INV/1 Inverse problems

Track Classification: Inverse problems