Contribution ID: **11** Type: **Oral**

Bayesian integrated estimation of tungsten impurity concentration at WEST

Monday, 12 June 2023 14:40 (30 minutes)

An accurate estimation of impurity concentrations in fusion devices is crucial for understanding impurity transport and controlling impurities. However, this is challenging due to the involvement of multiple diagnostics and their various sources of uncertainties. In this work, we utilize integrated data analysis (IDA) based on Bayesian probabilistic theory to jointly estimate impurity concentrations and kinetic profiles at WEST, using measurements from soft X-ray (SXR), interferometry and electron cyclotron emission (ECE). Compared to taking results from individual diagnostics, IDA has the advantage of exploiting the interdependencies of diagnostics and avoiding error accumulation. To overcome the additional challenge of reconstructing 2D SXR emissivity profile from the single horizontal view at WEST, we use a Gaussian process with a flux-varying length scale. We also investigate techniques for accelerating the inference process towards real-time applications. We demonstrate fast reconstruction results of density profiles obtained by a neural network surrogate model trained on synthetic interferometry data corresponding to realistic profiles. Ultimately, this approach will be extended to the joint estimation of impurity concentration, density and temperature profiles.

Speaker's Affiliation

Ghent University, 9000 Ghent, Belgium

Member State or IGO/NGO

Belgium

Primary author: WU, Hao (Ghent University)

Co-authors: VERDOOLAEGE, Geert (Ghent University); MAZON, Didier (CEA Cadarache); JARDIN, Axel (Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN))

Presenter: WU, Hao (Ghent University)

Session Classification: IDA/1 Integrated data analysis and synthetic diagnostics

Track Classification: Integrated data analysis and synthetic diagnostics