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Fast X-ray tomographic inversions for impurity transport analysis in tokamak plasmas

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.

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