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# X-ray tomography for impurity transport studies in tokamak plasmas

**A. Jardin**[1)]

[1)] *Institute of Nuclear Physics Polish Academy of Sciences (IFJ PAN), PL-31-342, Krakow*, Poland
axel.jardin@ifj.edu.pl

## Abstract

Modern tokamaks such as ITER – International Thermonuclear Experimental Reactor and WEST – Tungsten (W) Environment in Steady-State Tokamak, located in Cadarache, France, have selected tungsten plasma-facing components instead of traditional carbon, in order to limit tritium retention in the walls. Consequently, heavy impurity radiation has become a serious issue to consider, due to its deleterious impact on fusion performance. For instance, tungsten concentration should be kept well below 0.01% in the plasma core to avoid unmanageable cooling by radiation in future fusion reactors [1]. In this context, plasma tomography is one of the key methods to study the transport of impurities and impurity poloidal distribution in tokamaks, in particular in the soft X-ray (SXR) energy range 0.1 – 20 keV. Nevertheless, estimating the local plasma emissivity from a sparse set of noisy line-integrated measurements is a mathematically ill-posed reconstruction problem, that requires an adequate regularization procedure [2]. The goal of this contribution is therefore to introduce the concepts mentioned above, with a focus on some specific reconstruction methodology and examples.

## References

[1] T. Pütterich *et al*, *Determination of the tolerable impurity concentrations in a fusion reactor using a consistent set of cooling factors*, (2019) *Nucl. Fusion* 59 056013.
[2] A. Jardin et al, *Implementing an X-ray tomography method for fusion devices*, Eur. Phys. J. Plus, 136 (2021) 706.