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Tutorial_10: First principles modeling of fast electron physics

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Abstract: Quantitative modeling of the fast electron physics from first principles has always been a challenging but crucial task in order to understand observations from microscopic processes in the plasma. Synthetic diagnostics play a central role in the data analysis, allowing to make direct comparisons between modeling and measurements, thus reducing the uncertainties on the physical mechanisms at play, making the tools not only interpretative but also potentially predictive. This approach is based on a chain of numerical codes which are linked together with consistent physical and numerical assumptions. The framework in which these tools are implemented is a fundamental step to address many physical problems, not only for a single shot analysis as done usually, but also to perform massive calculations (multi-machine, -shot or -time), thus allowing detailed statistical analysis which may be valuable for estimating parametric dependencies and sensibility to the multiple parameters. The scripting methodology is presented, and its implementation for fast electron physics studies, in particular interaction with W ions, during Lower Hybrid current drive regimes is shown with applications to Tore Supra or WEST discharges using the ALOHA/METIS/C3PO/LUKE/R5-X2 chain of codes [1,2,3,4].

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- [1] J. Hillairet, et al., Nucl. Fusion 50(12), 125010 (2010)
- [2] J.F. Artaud et al., Nuc. Fusion 58, 105001 (2018)
- [3] Y. Peysson, et al., Plasma Phys. Control. Fusion 54, 045003 (2012)
- [4] Y. Peysson and J. Decker, Fusion Sci. Technol. 65, 22–42 (2014)
- [5] Y. Peysson and J. Decker, Phys. Plasmas 15(9), 092509 (2008)

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