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STATUS, PROSPECTS, AND BENCHMARKING OF THE MINERVA BAYESIAN MODELING FRAMEWORK AT WENDELSTEIN 7-X

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Over the last years, Bayesian Analysis became a standard method in plasma physics for a common plasma parameter profile determination and mathematical correct error analysis [1-3], evaluating data measured by various diagnostics.

This paper gives an overview of established as well as recently deployed physics models within the Minerva Bayesian analysis framework [2] for a wide range of different diagnostics operated at Wendelstein 7-X, such as two X-ray imaging spectrometers (XICS) [4], a charge exchange recombination spectroscopy diagnostic (CXRS) [5], an X-ray tomography system (XMCTS) [6,7], a Thomson scattering (TS) [8], an electron cyclotron emission (ECE) [9], and an effective charge measurement (Z_{eff}) [10] diagnostic.

Upon individual examples, benchmarking of evaluated plasma parameters in cross comparison for different diagnostics, e.g. Te, Ti, and nAr observed with XICS, CXRS, and TS will be discussed as well as prospects for the application of artificial neural networks for fast data analysis of complex physics models.

- [1] R. Fischer, L. Giannone, J. Illerha et al. *Fusion Sci. Technol.*, 76 (2020)
- [2] J. Svensson, A. Werner, *Proceedings IEEE Workshop on Intelligent Signal Processing WISP* (2007)
- [3] L.M. Reusch, M.D. Nornberg, J.A. Goetz et al. *Rev. Sci. Instrum.* 89 (2018)
- [4] A. Langenberg, N. Pablant, Th. Wegner et al. *Rev. Sci. Instrum.* 89 (2018)
- [5] O. Ford, L. Vanó, A. Alonso et al. *Rev. Sci. Instrum.* 91 (2020)
- [6] C. Brandt, J. Schilling, H. Thomsen et al. *Plasma Phys. Control. Fusion* 62 (2020)
- [7] J. Schilling, H. Thomsen, C. Brandt et al. *Plasma Phys. Control. Fusion* 63 (2021)
- [8] S.A. Bozhakov, M. Beurskens, A. Dal Molin et al. *JINST* 12 (2017)
- [9] U. Hoefel, M. Hirsch, S. Kwak et al. *Rev. Sci. Instrum.* 90 (2019)
- [10] A. Pavone, U. Hergenbahn, M. Krychowiak et al. *JINST* 14 (2019)

Affiliation

Max-Planck-Institute for Plasma Physics

Country or International Organisation

Germany

Authors: Dr LANGENBERG, Andreas (Max-Planck-Institut für Plasmaphysik, 17491 Greifswald, Germany); Dr SVENSSON, Jakob (Max-Planck Institute for Plasma Physics); PAVONE, Andrea (Max-Planck Institute for Plasma Physics); Dr KWAK, Sehyun (Max-Planck Institute for Plasma Physics); Dr HÖFEL, Udo (Max-Planck-Institut für Plasmaphysik); Dr FORD, Oliver; Dr BRANDT, Christian (Max-Planck-Institut für Plasmaphysik); Mr

SCHILLING, Jonathan (Max-Planck-Institut für Plasmaphysik); Dr THOMSEN, Henning (Max-Planck-Institut für Plasmaphysik)

Presenter: Dr LANGENBERG, Andreas (Max-Planck-Institut für Plasmaphysik, 17491 Greifswald, Germany)

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