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Stellarator optimisation: a brief review

Wednesday 4 October 2023 09:00 (50 minutes)

In this talk, I will give an overview of the history and present state of stellarator optimisation. Wendelstein 7-X was optimised for good magnetic flux surfaces, small Pfirsch-Schlüter and bootstrap currents, high MHD beta limit, and good neoclassical confinement. Most of these properties have already been confirmed experimentally, giving confidence that theory-based optimisation can pay off handsomely in terms of plasma performance [1].

Thanks to the development of stellarator theory and computational power, it is becoming possible to optimise stellarators for additional properties. Experiments in LHD and W7-X have shown that most of the energy losses are due to plasma turbulence, which motivates recent efforts trying to reduce such losses. I will describe these efforts and discuss how they fit into the greater picture of neoclassical optimisation by means of quasisymmetry or quasi-isodynamicity.

[1] C.D. Beidler et al., Nature 596, 221 (2021).

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