Transport modelling of operational scenarios in W7-X

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The flexibility of the W7-X magnetic coil system allows the creation of magnetic configurations with different confinement properties and bootstrap current values [1]. One of the optimization criteria for the stellarator W7-X is the minimization of the bootstrap current. The plasma current alters the rotational transform and affects the magnetic configuration near the plasma edge, where the island divertor is located, and thus endangers its proper functioning. In this contribution 1-D predictive transport modeling is used to study the scenarios for compensating the bootstrap current in ECR-heated plasma at moderate densities with the X2-mode heating and to investigate the way to high density operation \((n\sim2\times10^{20} \text{m}^{-3})\) with the O2-mode heating. The magnetic configuration and related neoclassical diffusion coefficients are recalculated self-consistently with transport modelling by VMEC and DKES codes correspondingly. Power deposition and current drive profiles are calculated by ECRH code TRAVIS coupled with the transport code. Several typical magnetic configurations are considered.

1. J. Geiger. Physics in the magnetic configuration space in Wendelstein 7-X. This conference.