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P2.1067 Parametric equilibrium reconstructions for Wendelstein 7-X with V3FIT

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The reconstruction of the plasma equilibrium plays an important role in interpreting diagnostic signals and understanding the plasma performance for toroidal fusion experiments. Reconstructing the plasma parameters is an iterative process that involves solving the MHD equilibrium, computing synthetic diagnostic signals based on that equilibrium and comparing these signals to measured signals. The parameters that describe the equilibrium are adjusted between iterations to find a best-fit of the measured and synthetic signals. The shape of the plasma, the location of the plasma edge, and profile information regarding the plasma pressure, current, and individual plasma species (e.g. Te, Ne, Ti, Ni) are the output of the reconstruction. These profiles are then used to interpret diagnostic information and for further physics analysis.

The constraints for the reconstructions of plasmas at Wendelstein 7-X (W7-X) include magnetic diagnostics, Thomson Scattering, interferometry, electron cyclotron emission, soft x-ray arrays and x-ray imaging crystal spectroscopy. Constraints on the plasma last closed flux surface are discussed for the various experimental magnetic configurations of W7-X. Furthermore, the sensitivity of the equilibrium reconstruction to coil models (as-built',EM-loaded') is also presented. The MHD equilibrium solution is provided by VMEC, which assumes solution with nested, closed flux surfaces. A recently developed parameterization of the current density has been implemented which enables the reconstruction to more directly specify radially-localized regions of the current density, improving the range and flexibility of current density profiles that can be represented and reconstructed.

Equilibrium reconstructions of long-pulse discharges both with and without electron cyclotron current drive are shown. Future plans for the application of V3FIT reconstructions to W7-X plasmas are also discussed.

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