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P4.030 AUG flight simulator development

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Fenix, the ASDEX Upgrade (AUG) flight simulator under development, is based on the Plasma Control System Simulation Platform (PCSSP) developed for ITER and the ASTRA transport code. Fenix will give a session leader the possibility to check whether the discharge will meet experimental goals prior to execution. It reads the AUG discharge program and checks if all the parameters and reference waveforms are reasonable during the discharge simulation.

ASTRA serves as a plant (physical model of AUG tokamak) which outputs idealised diagnostics signals (temperature, density, etc.). ASTRA calculates them from particle transport in the plasma core, plasma edge, Scrape of Layer (SOL) and divertor. It also includes particle balance, L-H transition and sawtooth models, and is equipped with the 2D equilibrium reconstruction code SPIDER.

The second component of Fenix is a model of the Discharge Control System (DCS). It simulates DCS controllers and AUG actuators. The DCS model processes data from ASTRA, calculates commands for actuators and sends them back to ASTRA closing the feedback loop. Controllers for coil currents to control plasma current, position and shape are also implemented in the model as well as gas puff valves (divertor and midplane) and the pellet injector to control electron density. The DCS model also simulates external heating actuators such as NBI, ECRH and ICRH.

Currently, Fenix models actuators, diagnostics and controllers. It has methods for reading configuration files and archiving. This article presents modelling of the ASTRA and DCS components, and first results from the simulations of the plasma ramp-up and flattop phases.

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