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Progress Toward Real-Time Control of Plasma Dynamics and Equilibrium via Tomographic Inversion of EUV Emissivity Profiles on the HBT-EP Tokamak[1] RIAN CHANDRA, BOTING LI, JOHN BROOKS, JEFFREY LEVESQUE, YUMOU WEI, IAN STEWART, ALEX SAPERSTEIN, CHRISTOPHER HANSEN, GERALD NAVRATIL, MICHAEL MAUEL, Columbia Univ, HBT-EP TEAM — In pursuit of fully nonmagnetic plasma control, this poster presents continuing progress on the Extreme-Ultraviolet (EUV) emission feedback system installed on the HBT-EP tokamak. The system consists of four fan arrays installed in a poloidal plane, capturing 15-10^4eV photons through a 100nm aluminum filter. Emissivity topologies are recovered via tomographic inversion from the photocurrents in a 22μs cycle on a NVIDIA 580 GTX GPU. These 2D inverted profiles are the target of feedback, building on prior work [1] in which basis structures extracted from the raw EUV data were tracked, and feedback applied based on their assumed underlying m/n structure. Forty inductive coils providing ±60 Gauß each provide actuation at ten toroidal and four poloidal locations. Real time EUV sensor data is projected in parallel onto multiple basis modes, and the optimal mode is selected by minimizing reconstruction error. In this way, the magnetic structure for mode canceling feedback is chosen adaptively. The same technique is demonstrated in control of the plasma equilibrium major radius. Error reduction schemes and of the techniques of refinement of the basis functions used are further shown.
[1] Levesque J.P *et al* 2019, *APS-DPP*

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