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Estimation of Angular Momentum Transport Coefficients via Extended Kalman Filtering Theory[1] CHAO XU, EUGENIO SCHUSTER, Lehigh University — The accuracy of first-principles predictive models for the evolution of plasma profiles is sometimes limited by the lack of understanding of the plasma transport phenomena. In this work we use the extended Kalman filtering theory to provide real-time estimates of poorly known or totally unknown angular momentum transport coefficients. These estimates are based solely on input-output diagnostic data and limited understanding of the transport physics. We first assume that the plasma dynamics can be governed by a tractable model obtained by first principles but the transport coefficients are considered unknown and to-be-estimated. The partial-differential-equation model is discretized both in space and time to obtain a finite-dimensional discrete-time state-space representation. The system states and to-be-estimated coefficients are then combined into an augmented state vector. The resulting nonlinear state-space model is used for the design of an extended Kalman filter that provides real-time estimations not only of the system states but also of the unknown transport coefficients.

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