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FRC equilibrium reconstruction by Bayesian evaluation of Monte Carlo transport simulations NIKOLAUS RATH, M. ONOFRI, E. TRASK, Tri Alpha Energy, TAE TEAM[1] — Beam-driven field reversed configurations (FRCs) can be sustained for multiple ms. Many important properties of such FRCs can not be measured directly. When such properties are needed to guide experiments, they are either substituted by proxies (e.g. the excluded flux radius $r_{\Delta\Phi}$ is used instead of the separatrix radius r_s), or derived from other measurements by imposing specific models (e.g. $\langle T \rangle$ is computed from $\int n\, dl$ by assuming $B^2 \sim nT$). With increasing fast ion population these methods become increasingly inaccurate, so a third method has been developed. Transport simulations are run with a variety of model parameters and snapshots saved periodically, resulting in a pool of feasible plasma states. Synthetic measurements for each state are compared with experimental measurements, giving a probability distribution of states for each time-point in the experiment. Properties like r_s and T are taken from the simulated state most consistent with measurements. The probability distribution gives a measure of the uncertainty in each parameter. The method validated by comparison with independent measurements. Reconstruction takes seconds per time-point.

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