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Validation of Tokamak Equilibria: Reconciling Theory and Observation Using BEAST GREGORY VON NESSI, MATTHEW HOLE, Research School of Physical Sciences and Engineering, The Australian National University, Canberra ACT 0200, Australia, JAKOB SVENSSON, Max-Planck-Institut fur Plasmaphysik, D-17491 Greifswald, Germany — We present a new technique for reconciling force-balance models with diagnostic observations via the statistical theory of Bayesian analysis. This method forms the backbone of a new data analysis code called BEAST (Bayesian Equilibrium Analysis and Simulation Technique) and is based on refactoring the force-balance relation into two different forward models, each associated with a 'fractional' observation, which are subsequently used in the Bayesian inference of the plasma equilibrium. By using a variant of the nested sampling algorithm, the evidence of the inferred posterior distribution is calculated and provides a relative quantification of how much the inferred equilibrium differs from a force-balance solution. Results are presented for discharges on the Mega-Ampere Spherical Tokamak (MAST), which are calculated using pickup coil, flux loop and Motional-Stark Effect (MSE) diagnostic data.

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