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JET DT Scenario Extrapolation and Optimization with METIS

JAKUB URBAN, FABIEN JAULMES, Institute of Plasma Physics of the CAS, Prague, Czech Republic, JEAN-FRANCOIS ARTAUD, CEA, IRFM, F-13108 Saint Paul Lez Durance, France — Prospective JET (Joint European Torus) DT operation scenarios are modelled by the fast integrated code METIS. METIS combines scaling laws, e.g. for global and pedestal energy or density peaking, with simplified transport and source models, while retaining fundamental nonlinear couplings, in particular in the fusion power. We have tuned METIS parameters to match JET-ILW high performance experiments, including baseline and hybrid. Based on recent observations, we assume a weaker input power scaling than IPB98 and a $\sim 10\%$ confinement improvement due to the higher ion mass. The rapidity of METIS is utilized to scan the performance of JET DT scenarios with respect to fundamental parameters, such as plasma current, magnetic field, density or heating power. Simplified, easily parameterized waveforms are used to study the effect the ramp-up speed or heating timing. Finally, an efficient Bayesian optimizer is employed to seek the most performant scenarios in terms of the fusion power or gain.

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