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TH/P2-18: New Technique for the Calculation of Transport Profiles in Modulation Experiments

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Transport codes provide a classical way to infer the profile of transport coefficients in fusion plasmas: assuming given functionals for the transport coefficient profiles, the free parameters are iteratively adjusted to best reproduce the measurements. This work introduces a new technique, the matrix approach (MA), which avoids any a priori constraint of the profiles, and computes them by simply inverting a 2D matrix, which also provides the uncertainty on the reconstruction for the case of modulation experiments. This is done by a controllable smoothing of the experimental data, instead of the ad hoc regularization of the profile of transport coefficients operated by transport codes. As a preliminary check, the MA was applied to already published JET data of momentum transport corresponding to three discharges that share the same initial equilibrium state. While an analysis of the data by a transport code suggests that all three cases share nearly the same transport coefficients, the MA rules this out, since the three uncertainty domains do not overlap at the various measurement positions. This suggested performing a similar analysis involving a residual stress on top of the advective and diffusive contributions to the flux. Then a single set of transport coefficients was found to be compatible with all three cases.

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