

The role of structured multi-purpose databases in fusion research

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Most databases in fusion research are devoted to a single topic, such as energy confinement, H-modes, profiles or disruptions. In order to allow for a wide range of analysis, modelling and validation tasks, a broad-based multi-purpose database, JETPEAK, has been developed for JET. This database currently includes 23000 stationary state ($\partial/\partial t \approx 0$) manually selected samples, averaged time windows of typically 0.1-1s duration. The database includes near 1000 scalar, 1D (profiles) and 2D (R & Z dependent) variables grouped into topical structures including equilibrium variables, electron and ion kinetic data from various sources, heating system data, data from visible spectroscopy and neutron diagnostics, as well as from various analysis codes used at JET, in particular the Monte Carlo heating code ASCOT. The list of variables is open and new variables have been added over time in order to satisfy new analysis requirements. JETPEAK is used for purposes as varied as comparisons of theoretical predictions with experimental data, modelling and prediction of DD, TT and DT neutron rates, energy, momentum and particle confinement scaling, long term monitoring, data consistency testing, validation, code benchmarking and code development. Two novel methods for neutron tomography which have been developed using JETPEAK will be presented together with examples of the other applications mentioned. This broad-based approach has since been exported to the TCV and ST40 tokamaks, leading to the creation of databases similar to JETPEAK. The TCVDTB database has 65000 samples reaching back to initial TCV operation the nineties. The older samples were obtained using an automatic program for identifying stationary discharge phases based on a set of 16 stationarity criteria. Software for combining 'JETPEAK-like' databases from different devices into a multi-machine database has been developed and may be used in future developments of international databases.

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