Profile and Confinement database within the Work-Packages JET1 and MST1

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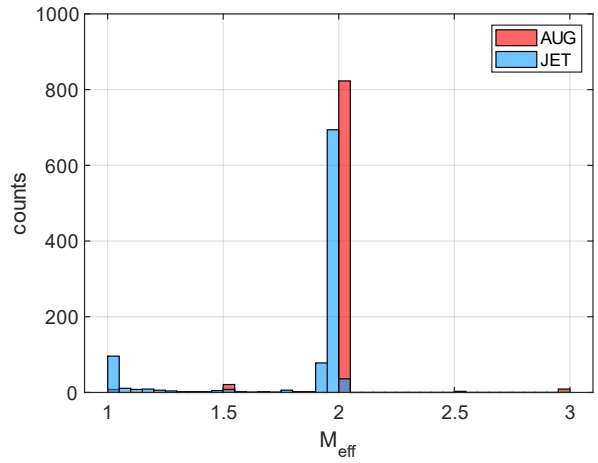
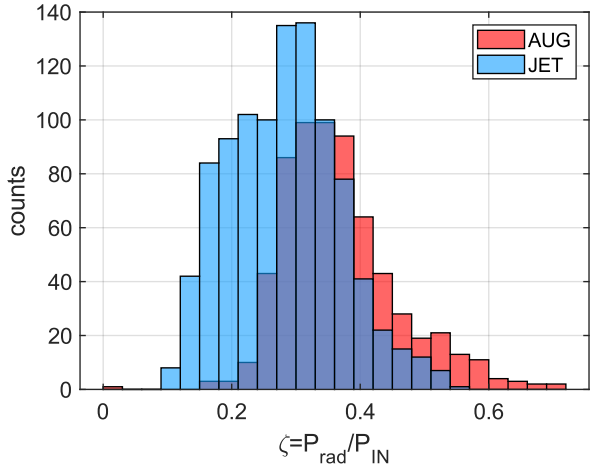
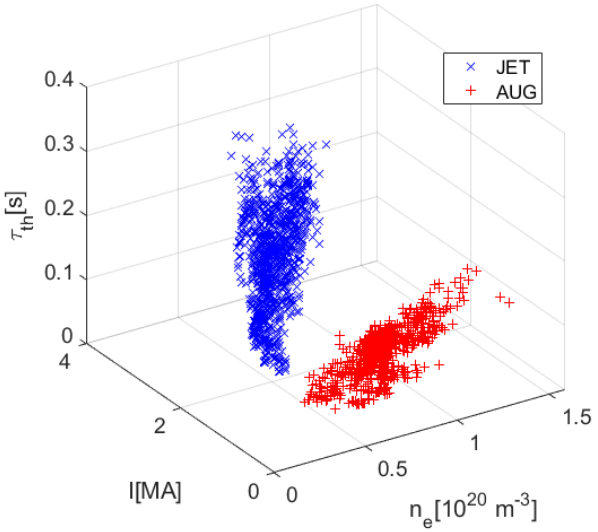
0D and 1D databases

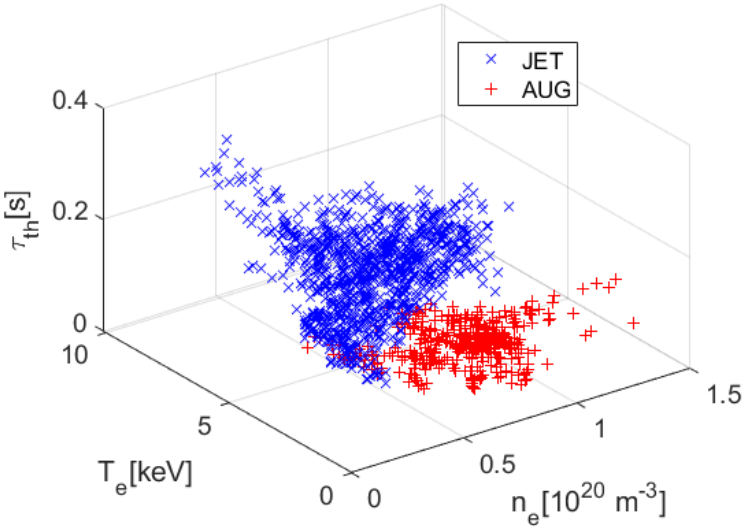
- **0D**: Metallic wall machines considered: JET, AUG are included (data to be updated). WEST has been contacted in August 2021.
- Quantities are labelled according to the ITPA standard; data will be provided to EUROfusion according to IMAS standards.
- JET: 977 entries from 840 pulses, with various isotopic mixtures and high performing pulses in C38 ($I_p \in [1.0,4.0]MA, n_e \in [2.0,9.9]10^{19}m^{-3}, B_t \in [1.0,3.9]T, M_{eff} \in [1,2], \tau_{th} \in [84.7,356,1]ms$)
- AUG: 864 entries from 420 pulses. The fast ion contribution and confinement times have been corrected for specific pulses (313/420 pulses) by AUG experts using the RABBIT code ($I_p \in [0.6,1.2]MA, n_e \in [3.7,15.9] \cdot 10^{19}m^{-3}, B_t \in [1.6,2.9]T, M_{eff} \in [1,3], \tau_{th} \in [25,3,146.9]ms$). Final checks being performed.
- WEST : Contacts with WEST started in 2021. Data will be added when available.
- **1D**: JET data have been chosen to build the starting nucleus of the DB.
- Preparatory meetings have been held with relevant specialists.

0D illustrative plots









0D database. IMAS

- **0D requests (and difficulties)**:
- At the moment, the main following quantities have been considered:
  - General: SHOT, T1, T2, NEL, IP, BT, MEFF, VTOR0, COMM(*), EXPER(*)
  - Geometry: AMIN, AREA, DELTAU, DELTAL, DELTA, KAPPA, KAPPAA, KAREA, Q95, RGEO, RMAG, VOL
  - Heating: PICRH, PICRHC, PINJ, PNBI, POHM, PECRH, PRAD, PL, PFLOSS, PLTH, NYIELD(*)
  - Stored energy and fast ions: WMHD, DWMHD, WFPAR, WFPER, WTH, WFICRH, WFICRHP
  - Temperatures: TE0, TI0, TI95(*), TE95(*)
  - Confinement times: TAUTH, TAUTOT

  (*)not ITPA variables

- Especially for AUG, further quantities are expected to be evaluated.

- I have not found any IMAS IDS to store the above 0D quantities. Consequently, I suggest to add a flexible (*quantities might be suggested and added also in a second moment*) “core 0D IDS” for the DB. The nomenclature can be kept as similar as possible to the ITPA one already in use to speed up the process of sharing data to the ITPA group in a second step.

- Following the presentation by J.A.Snipes at the 27th T&C ITPA meeting (*ITER_D_5S5N4Z*), I started having a look at the tools cited there, but in general, an illustrative, commented and simple script for mapping a toy-0D-quantity would help speeding up the process.

1D database and IMAS

- **1D**: JET data have been chosen to build the starting nucleus of the DB.

- Preparatory meetings have been held with JET experts. The following, time averages quantities have been selected to be considered for the initial contribution, some (in italics) are still under discussion. The provisional names are not expected to reflect the final definitions.

- Power deposition related profiles: PNBI(ρ)[2], *PFLOSSES(ρ)*, PICRH(ρ)[2], POHM(ρ)[2], *PLTH(ρ)*
- Energy related profiles: W(ρ) (diamagnetic energy)[1], W(ρ) (from MHD), Wth, dW(ρ)/dt, τ_TH (ρ), WFPER(ρ),WFPAR(ρ);
- Plasma effective charge (0D quantity): Zeff
- *Gradients*: $\nabla T_{(i,e,impurities)}$, ∇n_e, $\nabla vtor$
- Other: P_rad(ρ) [3]; Te(ρ)[1]; Ti(ρ)[1]; Ti_impurities(ρ) ; ne(ρ)[1], vtor(ρ)[1], B_tor (ρ), further geometrical quantities to be specified in a second step;

- Color legend: Not listed in IMAS[1,2,3] at the moment / already listed in IMAS' either [1] or [2] or [3] IDS

- However, to avoid splitting data into many IDSs, I suggest to foresee the creation a unique IDS entry.

[1] https://sharepoint.iter.org/departments/POP/CM/IMDesign/Data%20Model/CI/imas-3.33.0/core_profiles_flat.html
[2] https://sharepoint.iter.org/departments/POP/CM/IMDesign/Data%20Model/CI/imas-3.33.0/core_sources_flat.html
[3] https://sharepoint.iter.org/departments/POP/CM/IMDesign/Data%20Model/CI/imas-3.33.0/bolometer_flat.html

Proposed Tasks from 2022

- 0D:
- JET, in collaboration with the contact person:
  - A)include data from JET pulses of TT and DT campaigns;
  - A)include He pulses from C31 forward;
  - B)include pellets fuelled pulses;
  - B)include high radiative discharges;

- AUG, in collaboration with the contact person:
  - A)increase the number of discharges with isotopic mixtures;
  - B)include pellets fuelled pulses;
  - B)Increase the number of high radiative discharges;

- WEST, in collaboration with the contact person:
  - Include data in stationary H mode phase

- 1D:
  - A)Building the initial nucleus of the DB using the JET contribution.
  - B)Include AUG data