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

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0D database

- The zero dimensional database is made by quantities evaluated in a specific time window.

- JET and AUG (since full metallic wall) are included.
- Quantities are labelled according to the ITPA standard.

- JET:
- 867 entries from 811 pulses, H, D, H+D pulses up to pulse #92471 (C38B, 14/11/2016)
- **+** 74 entries from 46 validated high performing pulses belonging to C38A,B,C have been included [1].

- To the whole database the neutron yield has been added.

- Adimensional quantities have been evaluated and included $\rho^*, \beta_t, \nu^*, k_a, \epsilon, q_{cyl}, \zeta, \omega_{ci} \cdot \tau_{th}$

- The previous coordinator M.Maslov left a program to retrieve data from JET. However he stepped back as contact person of JET at the beginning of 2021.

[1]Joerg Hobirk et al, JET TF meeting , 21 Jan 2020

0D database

- AUG :
- 825 entries from 405 pulses, (up to the pulse 34957, dated 26/10/2017)[2]. The first pulse (22755) is dated 29/02/2008 with full metallic wall at AUG.
- In agreement with the AUG contact person, Dr. Clemente Angioni and the WPTE TFL, a python program aimed at providing the EUROfusion DB for the AUG contribution for the zero dimensional database has been written from scratch by the present RO.
- The code is modular, documented, easy to interpret and provides also a list of code errors encountered during the creation.

- The following variables have been selected:
  - General: SHOT, T1, T2, NEL, IP, BT, MEFF
  - Geometry: AMIN, AREA, DELTAU, DELTAL, DELTA, KAPPA, KAPPAA, KAREA, Q95, RGEO, RMAG, VOL,
  - Heating: PICRH, PICRHC, PINJ, PNBI, POHM, PECRH, PRAD, PL, PFLOSS, PLTH, NYR (neutron yield*)
  - Stored energy and fast ions: WMHD, DWMHD, WFPAR, WFPER, WTH, WFICRH, WFICRHP,
  - Confinement times: TAUTH, TAUTOT

[2] https://users.euro-fusion.org/repository/pinboard/EFDA-JET/database/

*not an ITPA variable

0D database

- Unfortunately WFPAR, WFPER, WTH, TAUTH presented issues because of a not accurate evaluation of the fast ion content (*WTH and PLTH are influenced by WFPAR and WFPER; therefore also TAUTH is affected*).

- Consequently, the AUG contribution to the EUROfusion DB reflected, until March 2021, the one to the ITPA, in which the affected quantities had been manually corrected by AUG experts (problem now addressed with a new shotfile, see later).

- Since the Covid pandemic crisis slowed down the work in 2020, only at the end of 2020 a new shotfile (i.e a “DDA” with correlated “PPF” in JET’s terms) reporting corrected quantities has been made available. A systematic evaluation of the RABBIT code for the aforementioned quantities has been adopted for the shotfile production.

- The new shotfile reprocessed 296/405 pulses of the DB.

- AUG will not reprocess the other pulses shortly. Resources will be dedicated to new pulses of the actual and next campaigns.

- The python program has been then updated.

0D database

- The new shotfile, when available, constitutes the reference dataset for AUG. No discrepancies, higher than a 10% of the previously quantities delivered to the EUROfusion DB, should be expected according to the experts, especially on TAUTH. A discrepancy check is ongoing.

- Since late February 2021 41 entries, of discharges in H, H+D, H+He (He not included in JET DB), have been also added using the python code.

- Adimensional quantities have been evaluated and included $\rho^*, \beta_t, \nu^*, k_a, \epsilon, q_{cyl}, \zeta, \omega_{ci} \cdot \tau_{th}$

1D database

- JET has been chosen to start building the one dimensional DB . Consequently the RO had been interacting since the beginning of this year with JET's TFLs to discuss.

- Unfortunately, it has not been possible to set a meeting until now, but at the middle of March, a raw plan has been sent by email to the JET TFL appointed to follow such task (Costanza Maggi).

- The key-questions to discuss are the following:
  - A) Since the 1D DB requires the validation of profiles at different time instances, it has been suggested to select specific pulses with respect to the whole database (this selection has to include discharges with different fuel mixtures);
  - B) a number of quantities has been selected as a first *nucleus* of the database, but their evaluation and validation probably requires the contribution of specific specialists. It might also be the case that some quantities cannot be evaluated.
    - Power deposition related profiles (PNBI(r,t) and PFLOSS(r,t) (charge exchange power loss), PICRH(r,t), POHM(r,t)) using [JETTO+PENCIL, JETTO+PION] or ETS
    - Energy related profiles: W(r,t), dW(r,t)/dt, $\tau_{TH}(t)$; Plasma effective charge related profiles: Zeff(r,t)
    - Prad(r,t); Te(r,t); Ti(r,t); ne_{core}(r,T), vtor(r,T), B(r,t)

Conclusion

- JET 0D: it has been asked to the TFL of JET appointed to follow the evolution of task to nominate a new contact person for JET to include C38A,B,C, C39 and C40 pulses. The present coordinator has already started listing pulses to request data validation.

- AUG 0D: during the last meeting with AUG on the 10/02/21, emerged that:
  - A) AUG resources will be dedicated to run RABBIT simulation for new pulses of the forthcoming campaigns.
  - B) data collected with the new python script, belonging to runs corrected with RABBIT, are expected to be in line with previously provided data within 10%. A discrepancy check is in progress.
  - C) at the moment scarce interest emerged for including new pulses, while an higher interest emerged about the profile database.
  - E) it is planned to increase the number of quantities in the database using the python code.
  - F) the scientific exploitation of the 0D updated database has already started

- JET 1D: waiting for discussion with TFLs

- AUG1D: lower priority w.r.t JET. To be built later.