

EUROfusion Physics Project Board #08

# Overview of Status for 2025/2026

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Science Department**

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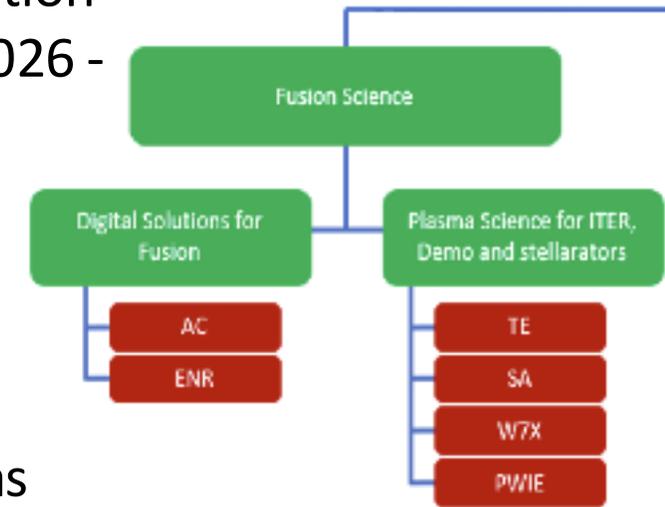




# Changes from Plasma Science to Fusion Science Department

## Organized in 5/6 Work Packages:

- **WP TE** Tokamak Exploitation (N. Vianello, E. Tsitrone, call for participation end of year, with most of participation resources aimed for January 2026 - as in past years),
- In the process of nominating Y. Kazakov as EU-EL for JT-60SA
- **WP STEL** Exploitation (follow up of WP W7-X + conceptual aspects towards stellarator reactor, M. Jakubowski + 2 Deputies (D. Carralero replacing A. Alonso))
- **WP PWIE** Plasma Wall Interaction & Exhaust (S. Brezinsek + D. Douai as new Deputy))
- **WP SA** JT-60SA Enhancements & Commissioning (C. Sozzi)
- **WP TM**: Theory and Modelling (X. Litaudon, contains all 11 TSVVs & to provide link with DSO and other WPs in PSD)
- WP ENR (no WP leader, PIs, most essential element in this context is contact to Theory)





# Objectives of the Fusion Science Department

- Address physics gaps for ITER with the priority on the ITER re-baselining
- Support the Foak physics programme → as DEMO terminology will be removed, DEMO parameters serve as a proxy for a First of a Kind, Foak, to provide orientation to the physics programme (e.g. need of no/small ELM regimes as e.g. QCE or combined with exhaust solutions such as XPR now both part of ITER considerations)
- Physics gaps towards ITER and relevance to DEMO/Foak scale largely overlap
- Increased focus on interpretative modelling (challenging to sustain in 2026 and more so in 2027 with reduced funds compared to the high funding available for 2025)
- *Aiming at addressing uncertainty quantification for interpretative modelling & in extrapolations for ITER and DEMO (addressed during General E-TASC Meeting in Feb. 2026, but limited funding of missions delay coordinated activity to drive the community – essential as the uncertainty determines the confidence and thus speed with which ITER could progress towards its goals, impact on discussion about pilot plants and crucial role in discussions around the DEMO LAR gate 2 review → presently ITER needs to learn a lot on its path as reliable extrapolation is not expected to be available in time)*



# Status of new activities in Plasma Science Department initiated in 2025

- **ITER:**
  - Memorandum of Understanding: High level objectives defined → final draft of “**Technical Specifications for activities to address gaps in the physics basis of ITER assembly, scenarios, plasma measurement analysis and simulations**” between ITER and Science Department agreed → delivery through 4 reportings D1-D4 (mid/end of each year)
- **JT-60SA:**
  - Supporting fast track transition to W actively cooled divertor & W wall ongoing, present focus on estimating required ECRF heating and if central (different frequency / field) or off axis (present frequency) sufficient
  - Preparing for OP2 campaign
- **Stellarators:**
  - „Key Physics Uncertainties and Related Investigation Needs towards Stellarator Reactor“ document published in idm ([2T9PQA](#))
  - assist prioritization of EUROfusion programme on exploiting stellarator line and FP10 discussion
- **Burning plasma Experimental Superconducting Tokamak (BEST)** under construction in China:
  - 1<sup>st</sup> Joint EU-CN research plan for BEST [published](#)
  - Discussion on essential/beneficial physics items to be discussed in FSD in view of collaboration and FP10
- **DTT:**
  - Delayed to end of pilot plant A/B discussions: Review of DTT Research Plan to identify activities in line with high priority EUROfusion objectives (6PM)



# The role of **Subjective** Scientific Readiness Levels

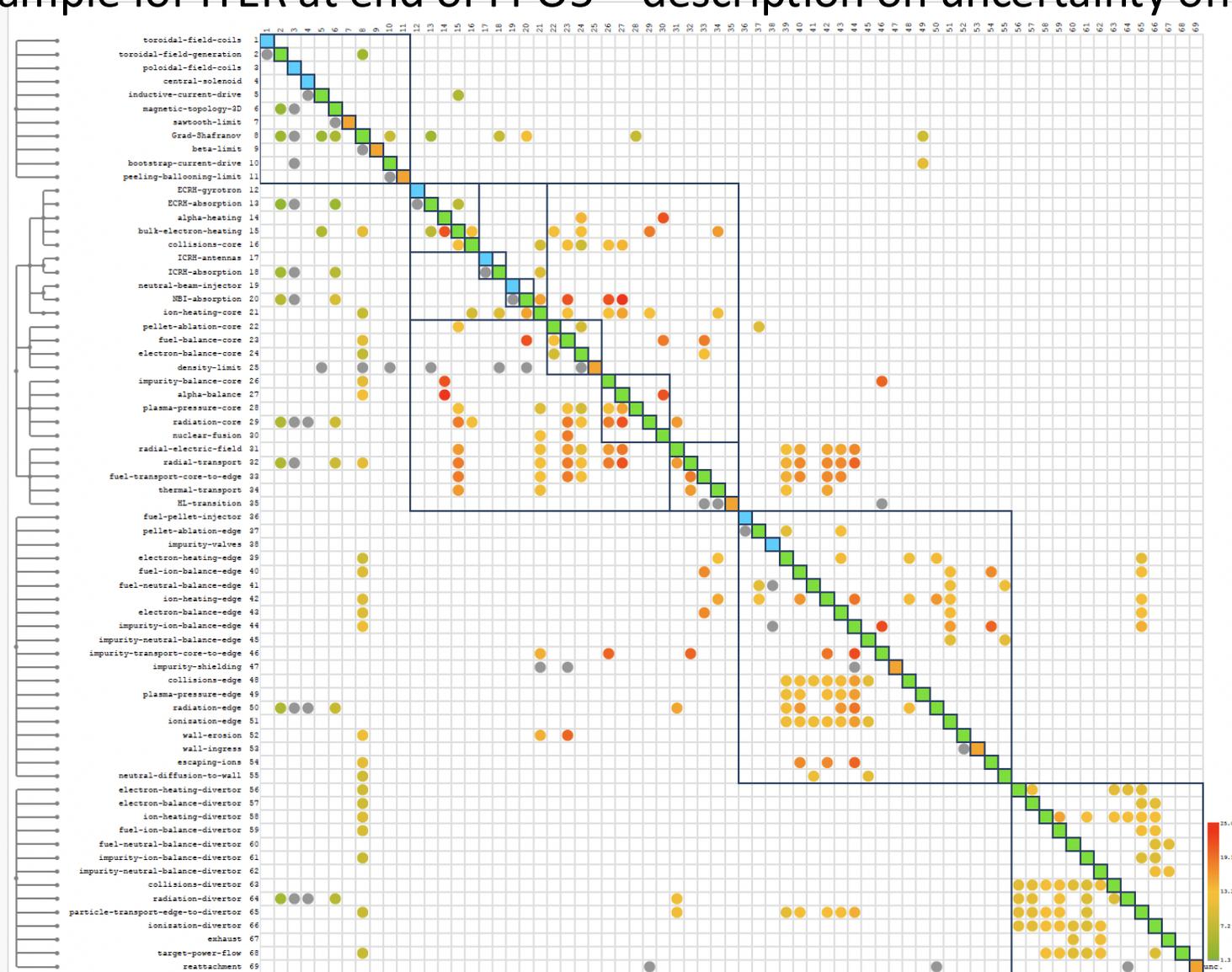
Level	Criteria
Emerging	Little or no understanding yet on WP TE devices
Exploratory	Physical process is assessed on WP TE devices, transposing to ITER or DEMO is uncertain
Judgemental	Controlling physical processes has been assessed on WP TE devices, but extrapolation to ITER/DEMO requires scalable parameters and further investigation
Mature - needs underpinning	Good understanding of controlling physical processes on WP TE devices, but major uncertainty in view of transposing ITER/DEMO
Mature - needs support	A good understanding has been achieved on WP TE devices, further research exploring ITER or DEMO relevant parameters
Established	Understanding is well developed and can be applied to ITER or DEMO

- Definition established within WP TE in 2021 and monitored since then, to be extended to PWIE (pending)
- For WPSTEL established TRL as of early 2026 (towards stellarator reactor defined in physics gaps document)



# Developed a Design Structure Matrix to assess areas of largest uncertainty

Example for ITER at end of FPO5 – description on uncertainty on processes



- EUROfusion pilot plant working group, sub-group 2 for physics (chaired together with M. de Baar) w. A. Loarte for ITER as a member
- Idea of a concept agnostic approach: tokamaks and stellarator
- DSMs were produced for 3 main phases of ITER (SRO, FPO-3 and FPO-5)
- DSM was also produced for W7-X towards a stellarator Foak
- Discrete events have not been addressed (yet)
- Outcome: at least one intermediate device required towards Stellarator Foak
- ITER likely to attain most TRL 7 (@FPO-3) during operations with *remaining uncertainties in the continuous physics associated with the alpha physics, impurities, wall erosion and edge transport*