WPSA CM Topical Session
Discharge simulator and scenario modelling (core/pedestal)

WPSA Project Planning Meeting, 6-9 September 2022

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WPSA.CM (Core/pedestal) modelling Tasks 2022

Specific focus on **modelling the Initial Research Phase**

TOPIC	Deliverable 2022	Del Owner
Scenario development transport analysis	**Integrated modelling of ramp-up of initial research phase scenarios** with first principles transport models	**L Garzotti** D Taylor (UKAEA) P Strand D Yadikin E Fransson (VR) P Huynh (CEA)
MHD and control	**MHD stability** chain deployed to users	R Coelho (IST)
	Application of CarMa-D model in state-space representation for developing **RWM control** time simulation and test controller concepts	**L Pigatto** *et al* *(ENEA RXF)*
	Estimate of **heat load levels and distributions caused by REs** via a workflow coupling particle tracing codes to FLUKA.	**J Caloud** A Casolari E Macusova (IPP.CR)
Pedestal and edge	Report/publication on (JOREK) modelling of **multiple pellet injection in self-consistently evolving pedestal profile**	**S Futatani** (CIEMAT UPC)
Energetic Particle modelling	Demonstration of automated application of the EP workflow to the assessment of **EP-stability in ramp-up and steady state plasmas**.	**Ph Lauber** (IPP-Garching)
	Provide ASCOT distribution function for beam ions	A Snicker (VTT)
	Analysis of **linear AE stability of initial research phase (H,D) scenarios**	R Coelho (IST)

EUROfusion wiki page WPSA.CM Area

Discharge simulator & (core/pedestal) modelling activities – this session

Wed 7th 14h-17h40
Topic session
Discharge simulator and scenario modelling:
core transport/turbulence, MHD & Fast particles stability, RWM control, ELMs

Discussions shall focus on activities aiming at the provision of validated modelling tools for JT-60SA operation and scientific exploitation:

- data needs for achieving 2022 modelling tasks deliverables
- scenario revision - identify limits and feasibility
- definition of discharge simulator use cases for trainings
- needs for advanced modelling

14:00	**Introduction: discharge simulator for experiment preparation**	*Dr Emmanuel Joffrin*	
	Room 1	14:00 - 14:10	
	Development status and plans	*Massimiliano Mattei*	
	Room 1	14:10 - 14:30	
	Simulator test cases	*Gerardo Giruzzi*	
	Room 1	14:30 - 14:50	
15:00	**Discussion on scope, scenario revision and needs**	*Gloria Falchetto*	
	Room 1	14:50 - 15:20	
	Scenario modelling status and plans	*Luca Garzotti*	
	Room 1	15:20 - 15:40	
	Discussion on advanced modelling needs	*Luca Garzotti*	
	Room 1	15:40 - 16:00	
16:00	**coffee break**		
	Room 1	16:00 - 16:30	
	Limits of nominal scenarios : MHD / RWM control	*Leonardo Pigatto et al.*	
	Room 1	16:30 - 16:50	
	Non-linear MHD simulation of pellet triggered ELMs	*Shimpei Futatani*	
	Room 1	16:50 - 17:00	
17:00	**Heat loads caused by REs**	*Jakub Caloud*	
	Room 1	17:00 - 17:10	
	Fast particles modelling	*Philipp Lauber*	
	Room 1	17:10 - 17:30	

DISCUSSION SLIDES

WPSA GPM 2022 Modelling session Q&A discussions & actions (1)

❖ **Discharge Simulator**

Actions: work with QST on feasibility of the scenarios in the PID

- ➢ test cases data list & links on wiki
- ➢ output data in IMAS for use by other codes/workflows

❖ **Scenarios**:

Additional assessments suggestions:

- ECH frequency used in Research Plan to be revised?
- assess if auxiliary power enough to access H-mode in H – extrapolated to D – to help ITER
- assess if enough ECRH power to tailor the q-profile? Eg relevant for hybrid scenario 4.2
- effect of impurities on ramp up.

Actions:

- ➢ cross verify output profiles from JINTRAC/ETS to provide unique IMAS/IDS data for eg EP stability calculations
- ➢ ET/TGLs / modelers to provide requests for more advanced modelling if needed
  - use ASCOT instead of PENCIL for NBI
  - assess QL models for L-mode eg use TGLF **2022 deliverable**

WPSA GPM 2022 Modelling session Q&A discussions & actions (3)

❖ **Energetic Particles**
- Investigate differences in EP stability btw Scenario 2 and high density
  EP studies ITER relevant very important if fast ions do or not drive the (TAE?) modes

❖ **RWM control**
- Sensitivity scans over some parameters
  - Interesting to know what limits the scenario eg NBI power ? Beta?

❖ **ELMs –pellets**
- Investigate topics for collaboration using MIPS code (Suzuki san) – synergetic not superposing to his RMP –ELM stabilization studies
- PB + gradients complex interplay with current on ELM triggering; also depending on injection time of the pellet
  - Stronger pellet shading on JT-60SA?
- Use more realistic parameters (eg resistivity) in JOREK
- Comparison of physics models eg Resistive MHD in JOREK vs MIPS could be interesting

❖ **MHD stability chain**
- Can address the resistive infernal mode or PB with resistivity?
  - ➢ Investigate an extension of the wf with calculation of delta'
  - ➢ Investigate (feasibility/resources) of implementation of MARS-F or CARMA in the chain

Actions Provide the analysed scenarios cases / data outputs
identify interested test users and set up dates for a training

Useful links wiki – EUROfusion Gateway – data repository

Please keep your Task wikipage up-to-date

- https://wiki.euro-fusion.org/wiki/WPSA:_Code_Management_and_Simulation
- The **EUROfusion Gateway** cluster is the home of WPSA code development work and shared simulation tools
  - **Gateway access request** please follow the procedure on: https://wiki.eufus.eu/doku.php
  - Gateway login (X2Go, NoMachine, ssh) g2username@login.eufus.eu
  - A training on the Gateway setup and use (as well as on IMAS) provided by ACH is available, links on: https://wiki.euro-fusion.org/wiki/ACH-04
- A **gitlab** has beeen setup: https://gitlab.eufus.eu/
- A repository for WPSA Gateway users has been created : **/afs/eufus.eu/gw/wpsa**
  you can request access to admins: mail to rcoelho@ipfn.ist.utl.pt; CC gloria.falchetto@cea.fr
- Previous JT-60SA modelling data is stored here:
  /afs/gw/wpsa/groupoffice/users/MODELING
- Documentation tutorials on discharge simulator METIS / CREATE_EGENE
  - https://wiki.euro-fusion.org/wiki/WPSA_CM:_Discharge_simulator
- Gateway repository : /afs/gw/wpsa/applications/