

2020 WPSA Planning Meeting
30/03 – 02/04 (VC)



Overview of modelling activities and 2020 plans

Presented by T. Bolzonella
on behalf of the WPSA modeling area team



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- In mid-February all modelling tasks had their KoM and discussed 2020 resources and plans.
- Working sessions were suggested (recommended) later in the year, especially to take advantage of synergies between different tasks.
- In this presentation 2020 structure and plans of WPSA modelling area will be summarized to help the general discussion and links with other activities.

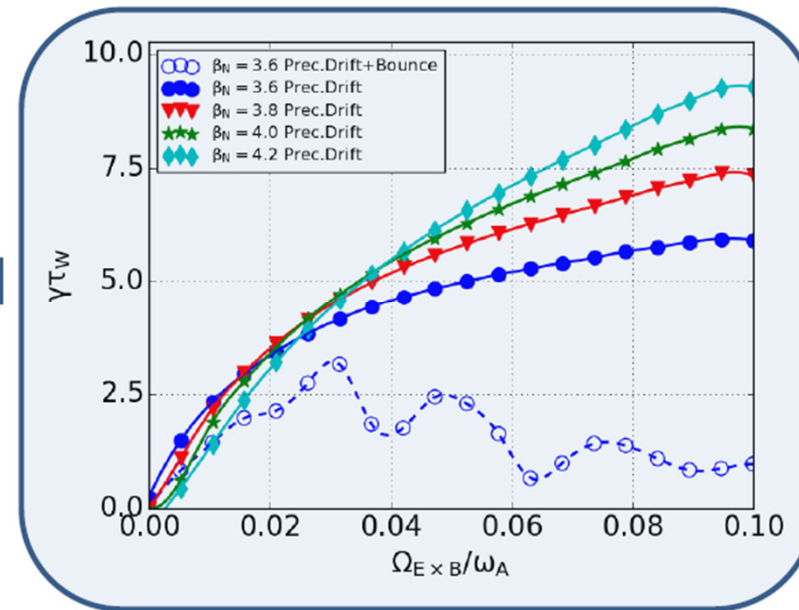
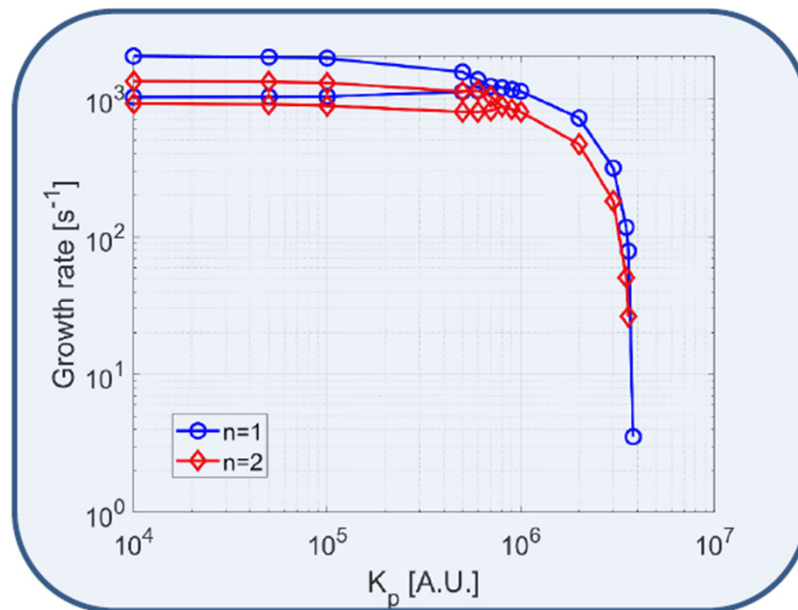
Activity	Title	Resources (PM, any budget included)
SA.M.A01	MHD and control modelling	6.50
SA.M.A02	Scenario, transport + edge modelling	8+9
SA.M.A06	Fast ion modelling	9

- Wide range of activities, with limited resources.
- Subjects and resources are discussed yearly: “on the fly” requests are always welcome, but reaction time might vary.



Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A01-T004-D001	MHD analysis of scenarios of Initial Research Phase I and II including WPCD workflows. Modelling of RWM control	Rui Coelho	IST	1.00
			ENEA	3.00
TOTAL				4.00
Deliverable team members: R. Coelho (IST), T. Bolzonella (ENEA-RFX), G. Marchiori (ENEA-RFX), L. Pigatto* (ENEA-RFX), M. Bonotto (ENEA-RFX), S. Nowak (ENEA-ISTP) *, O. Sauter (EPFL)*				

- Provide MHD stability support to scenario development activities.
- Extend and combine 3D MHD (RWM) physics and control.

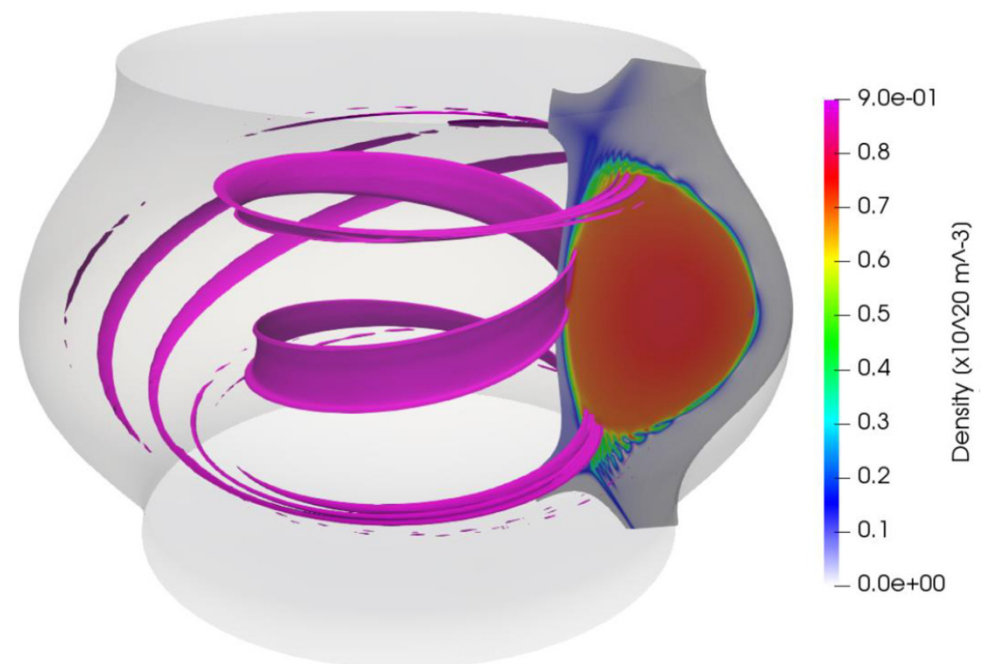
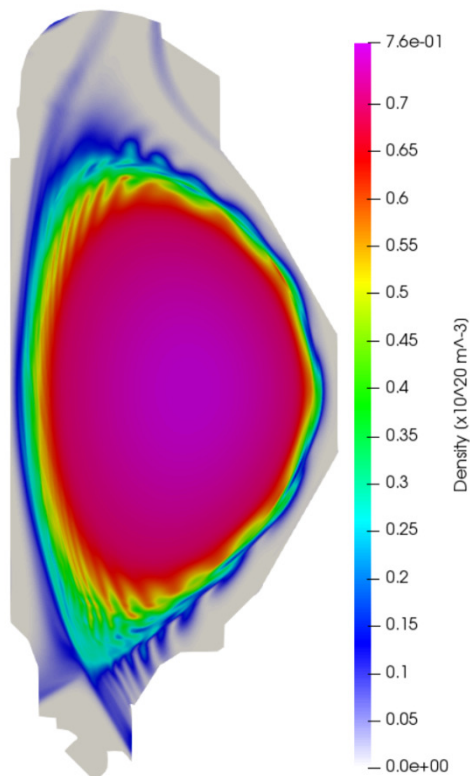


Note the paper: “Expanded capabilities of the CarMa code in modeling resistive wall mode dynamics with 3-D conductors”; M Bonotto *et al* 2020 *Plasma Phys. Control. Fusion* **62** 045016



Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A01-T004-D002	Non-linear simulations of ELM triggering by pellets (JOEAK)	Shimpei Futatani	CIEMAT	2.50
			TOTAL	2.50
Deliverable team members: S. Futatani (CIEMAT)				

- Sound equilibrium implemented; JOEAK input file prepared based on CRONOS simulation of JT-60SA
- Present: tune ELM simulations to reproduce particle/energy losses.
- (Near) future: include ideal wall geometry and evaluate heat-flux during ELM.



WPSA 2020 Scenario deliverables and resources



Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A02-T004-D001	Modelling of scenarios transient phases (METIS, CRONOS)	Jorge Morales	CEA	3.00
TOTAL				3.00
Deliverable team members: J. Morales (CEA), J.F. Artaud (CEA), J. Garcia (CEA)				
Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A02-T004-D002	Modelling of scenarios of Initial Research Phase I and II, including pellet injection (JINTRAC)	Luca Garzotti	CCFE	2.00
TOTAL				2.00
Deliverable team members: L. Garzotti (CCFE), J. Ferreira (IST)?				
Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A02-T004-D003	Effect of shaping on turbulent transport and confinement	Michele Romanelli	CCFE	1.00+2.00*
TOTAL				3.00
Deliverable team members: M. Romanelli (CCFE), O. Beeke* (CCFE)				

- Control q profile for hybrid and scenario in JT-60SA
- Modelling of scenarios of Initial Research Phase I and II
- Local gyrokinetic simulations of internal transport barriers
- Scenario modelling using ETS (in collaboration with WPCD and ETS RO)



Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A02-T004-D005	Edge and divertor modelling of JT-60SA scenarios with C wall with SOLEDGE code.	P. Innocente	ENEA	2.00+2.00*
			CEA	2.00
TOTAL				6.00
Deliverable team members: P. Innocente, L. Balbinot* (ENEA-RFX), G. Falchetto (CEA)				
Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A02-T004-D006	Edge and divertor modelling of JT-60SA scenarios with W wall with SOLPS-ITER code	M. Wischmeier	MPG	1.00
			ENEA	2.00
TOTAL				3.00
Deliverable team members: M. Wischmeier, R. Neu (MPG), G. Rubino (ENEA)				

- Modelling of JT-60SA with Carbon Wall
 - SOLEDGE2D-EIRENE: scenario assessment, comparison with SONIC on selected cases.
 - Introduce SOLEDGE3X code (new activity)
- Modelling of JT-60SA with W Wall
 - SOLPS-ITER: balance analyses of obtained results to identify main physical drivers to achieve safe operation and detachment
 - Mid-long term: Study of more realistic cases where puffing (both D and N) and pump are taken into account

WPSA 2020 EP deliverables and resources



Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A06-T004-D001	Modelling of fast ion distribution (ASCOT code)	T. Kurki-Suonio	VTT	2.00
			ENEA	2.00
			EPFL	1.00
TOTAL				5.00
Deliverable team members: T. Kurki-Suonio (VTT), P. Vincenzi (ENEA-RFX), M. Vallar (EPFL)				
Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A06-T004-D002	Analysis of fast ion instabilities during flat-top and current ramp-up phases (LIGKA code)	P. Lauber	MPG	2.00
			IST	1.00
TOTAL				3.00
Deliverable team members: P. Lauber (MPG), R. Coelho, P. Rodrigues (IST)				
Deliverable ID	Description	Deliverable Owner	RU	PM50%
SA-M.A06-T004-D003	Analysis of impact of fast ions on turbulence and transport	D. Zarzoso	CEA	1.00
TOTAL				1.00
Deliverable team members: D. Zarzoso (CEA)				

- Key topic with many subjects covered:
 - EP and MHD stability, turbulence and transport
 - Neutron sources (ASCOT/AFSI)
 - Anomalous fast ion diffusion with RMPs with plasma response

WPSA simulation data storage under IMAS: status and plans



Main JINTRAC and CRONOS data from published papers are already generated and stored under IMAS. Reference papers:

- ✓ J. Garcia et al 2014 Nucl. Fusion **54** 093010 “*Physics comparison and modelling of the JET and JT-60U core and edge: towards JT-60SA predictions*”
- ✓ L. Garzotti et al 2018 Nucl. Fusion **58** 026029 “*Analysis of JT-60SA operational scenarios*”

Next step is to move part of them to JT-60SA DMS to test sharing with EU and QST colleagues.

First potential “customer” activities: MHD and fast ion analysis

Whether this will be the final solution is still under discussion, comments from WPCD community are welcome!

Direct link between WPSA (scenario) modelling activities and WPCD/ITER Integrated Modelling Expert Group



- Collaboration between WPCD and WPSA develops upon well established bases and some WPCD experts are already part also of WPSA team.
- 2020 WPSA modeling needs will/can further enhance the use of WPCD/IMAS tools in the fields of:
 - MHD stability → systematic study of realistic plasmas for Initial Research Phases
 - Fast ion physics → LIGKA/HAGIS IMAS integration close to completion
 - Integrated scenario modelling → systematic ETS runs
 - Synthetic diagnostics → longer term
 - Simulation data storage under IMAS → ongoing discussion, including QST (Japan) counterpart
 - Support to discharge preparation → challenging...

Areas of further/future collaboration could include:

- training activities for WPSA modeling collaborators to be further pushed
- discussions about data access and sharing (including requirements from F4E and QST)
- JT-60SA data mapping under IMAS (during scientific exploitation)