Overview of SP B.2 and SP B.3 in 2022

Antti Hakola

This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

Goals and agenda of the meeting

The goals of the meeting are to

- Discuss the detailed work plans of tasks under SP B.2 and SP B.3,
- Identify possible gaps and opportunities for collaboration, and
- Decide on concrete next steps, to be reviewed in the midterm meeting

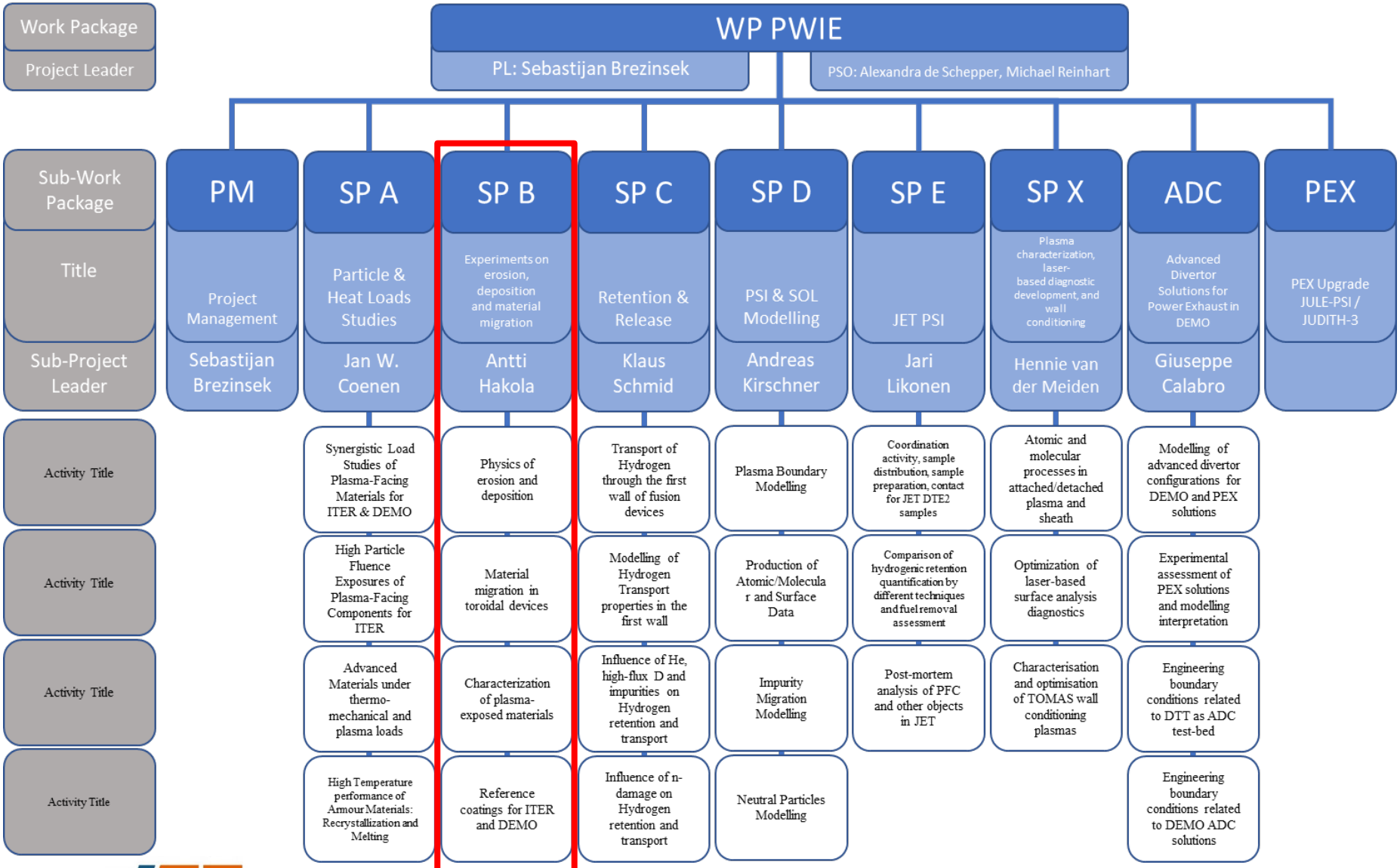
09:00	Introduction to PWIE and SP B
09:15	Thematic talks on analyses of WEST, W7-X, and AUG samples in 2022
10:30	1-slide summaries of the work to be done in the participating labs in 2022
11:00	Discussion and open points
11:30	End of the meeting

https://indico.euro-fusion.org/event/1958/

In this meeting we'll discuss **material migration, erosion, and deposition phenomena in toroidal device** from the **experimental point of view.** Modelling efforts are channelled under SP D.

Everybody is invited to contribute to the discussions, also those who are not task holders of any of the SP B.2/B.3 activities!

Structure of PWIE and SP B



SP B focus points in 2022 – relevant milestones

WM31	SP B	Effective sputtering yields and erosion rates of W model systems with varying impact angles, morphologies, and surface structures at varying plasma conditions available (ITER+DEMO)	31.12.2022 **SP B.1**
WM32	SP B	Erosion and re-deposition patterns on selected marker samples and plasma-facing components, extracted from ASDEX Upgrade (2019-2021), WEST (C4, C5), and W7-X (OP1.2B) elucidated (ITER+DEMO)	31.12.2022 **SP B.2** **SP B.3**
WM33	SP B	Be- and W-based reference coatings produced with composition, fuel content, and structure similar to those of typical co-deposited layers in tokamaks (ASDEX Upgrade, WEST, JET) (ITER+DEMO)	31.12.2022 **SP B.4**
WM34	SP B	Post-mortem analysis of material samples and components exposed to medium and high flux operation campaigns 2021/2022 in MAGNUM-PSI and PSI-2 performed.	31.12.2022 **SP B.1** **SP B.2** **SP B.3**

SP B deliverables in 2022 – SP B.2

Activity	Deliverable ID(s)	Title
SP B.2	D001	Erosion, re-deposition, and fuel-retention patterns on selected WEST PFUs after C3, C4, and C5 campaigns (CEA)
SP B.2	D002, D003	Balance between gross and net erosion of plasma-facing materials, including components with different surface roughness and morphology, in controlled L- and H-mode plasma experiments (JSI, VTT)
SP B.2	D004, D005, D006, D007, D008, D009, D010	Characterization of marker samples and coatings from selected plasma experiments on AUG, WEST, and/or W7-X with conclusions (FZJ, MPG, VR, IPPLM, RBI)

SP B deliverables in 2022 – SP B.3

Activity	Deliverable ID(s)	Title
SP B.3	D001	Database on ageing, erosion, and fuel-retention behavior of selected WEST PFUs (CEA)
SP B.3	D002, D003, D004, D005, D006, D007, D008	Characterization of selected AUG, WEST and/or W7-X wall tiles and plasma-exposed reference samples (FZJ, IPPLM, IST, IAP, MPG, NCSRD, VTT)

2022 Resources SP B.2

Deliverable Owner	Beneficiary	PM
M. Diez	CEA	2
M. Rasinski	FZJ	2
E. Fortuna-Zalesna	IPPLM	2
S. Markelj	JSI	3
K. Krieger	MPG	2
M. Mayer	MPG	2
M. Balden	MPG	2
I. Bogdanovic Radovic	RBI	3
P. Petersson	VR	2
A. Hakola	VTT	2
Total		**22**

Device	Beneficiary	Days	Related Deliverable
Accelerator	FZJ	3	D004
Accelerator	JSI	5	D002
Accelerator	MPG	8	D005, D006, D007
Accelerator	RBI	7	D010
Accelerator	VR	5	D008
Accelerator	VTT	1	D003

2022 Resources SP B.3

Deliverable Owner	Beneficiary	PM
M. Diez	CEA	2
M. Rasinski	FZJ	2
E. Fortuna-Zalesna	IPPLM	3
E. Alves	IST	2
E. Grigore	IAP	2
M. Mayer	MPG	5
K. Mergia	NCSRD	3
A. Hakola	VTT	2
Total		**21**

Device	Beneficiary	Days	Related Deliverable
Accelerator	IST	2	D004
Accelerator	MPG	7	D007
Accelerator	NCSRD	3	D006
Accelerator	VTT	1	D010
Accelerator	FZJ	3	D002

Quick overview of SP B key changes compared to 2021

- Most of the tasks will be **smooth continuation of the 2021 activities with the following exceptions**
  - ✓ new task for IAP under SP B.3 (analysis of WEST samples)
  - ✓ shifting the JSI task from SP B.3 to expand the scope of the SP B.4 task (analysis of Be reference samples)
  - ✓ inclusion of shifted 2021 tasks (DIFFER, IAP, IPPLM) into the 2022 work programme
- Main changes per activity
  - ✓ SP B.1: **MAGNUM-PSI and GyM experiments** to be initiated
  - ✓ SP B.2 and SP B.3: focus on **WEST C4 marker PFUs** and one ITER-like PFU and **MAGNUM-PSI samples**; inclusion of pre- and post-exposure characterization of **marker coatings for He experiments on AUG (July 2022)**
  - ✓ SP B.4: first 2021 batches available for analyses

- Main classes of **reference samples under SP B.4 in 2022**
  - ✓ W coatings with varying morphologies and compositions (w/ and w/o FIB markers) for PSI-2, MAGNUM-PSI, and GyM experiments
  - ✓ influence of O and seeding gases (N) on the structure and D content of Be and W reference coatings
  - ✓ influence of annealing on the properties of Be samples with H/D inclusions

Contact info and next steps

- Your SP B contact
  Antti Hakola (antti.hakola@vtt.fi)
- Project leader
  Sebastijan Brezinsek (s.brezinsek@fz-juelich.de)
- Project Support Officer
  Michael Reinhart (m.reinhart@fz-juelich.de)
- PMU Coordination Officer
  David Douai (david.douai@euro-fusion.org)

- ✓ Kick-off meetings and detailed definition of tasks
  March-April 2022
- ✓ Thematic meetings on topics agreed on in the review and planning meeting
  April-May 2022
- ✓ WPPWIE progress meeting – **July 2022**
- ✓ Midtem meeting of SP B activity areas – September-October 2022
- ✓ Review meeting of WPPWIE– **November 2022**

Minutes and slides of the meeting at https://indico.euro-fusion.org/event/1958/

SP B deliverables in 2022 – SP B.1

Activity	Deliverable ID(s)	Title
SP B.1	D001	Erosion rates of W model systems and composition and structure of re-deposited layers in MAGNUM-PSI at varying plasma conditions (DIFFER)
SP B.1	D002	Effective sputtering yields of W model systems with varying morphologies in pure and mixed plasmas in GyM and by hypervelocity dust impacts (ENEA)
SP B.1	D003	Erosion rates and angular distribution of W model systems with varying morphologies as well as composition and structure of re-deposited layers in PSI-2 at varying plasma conditions (FZJ)
SP B.1	D004, D006	Effective sputtering yields of W model systems with varying morphologies and structures, including angular distributions of sputtered particles, and re-deposited W layers following exposure to controlled D and impurity ion beams (ÖAW, VR)
SP B.1	D005	Size distribution and composition of Be and W dust formed during air and water leaks (IAP)

SP B deliverables in 2022 – SP B.4

Activity	Deliverable ID(s)	Title
SP B.4	D001	W-based coatings with pre-defined properties (incl. SEM, AFM, TDS characterization) produced for analyses and plasma experiments (ENEA)
SP B.4	D002	Be and W-based coatings with pre-defined properties (incl. SEM, XRD, GDOES, TDS characterization) produced for analyses and plasma experiments (IAP)
SP B.4	D003, D004, D005, D006, D007, D008	Characterization of selected Be and/or W reference samples (CEA, CIEMAT, IST, JSI, RBI, VTT)