Status Report for WPENR

3rd PWIE Project Board | 15.03.2022

D.Kalupin

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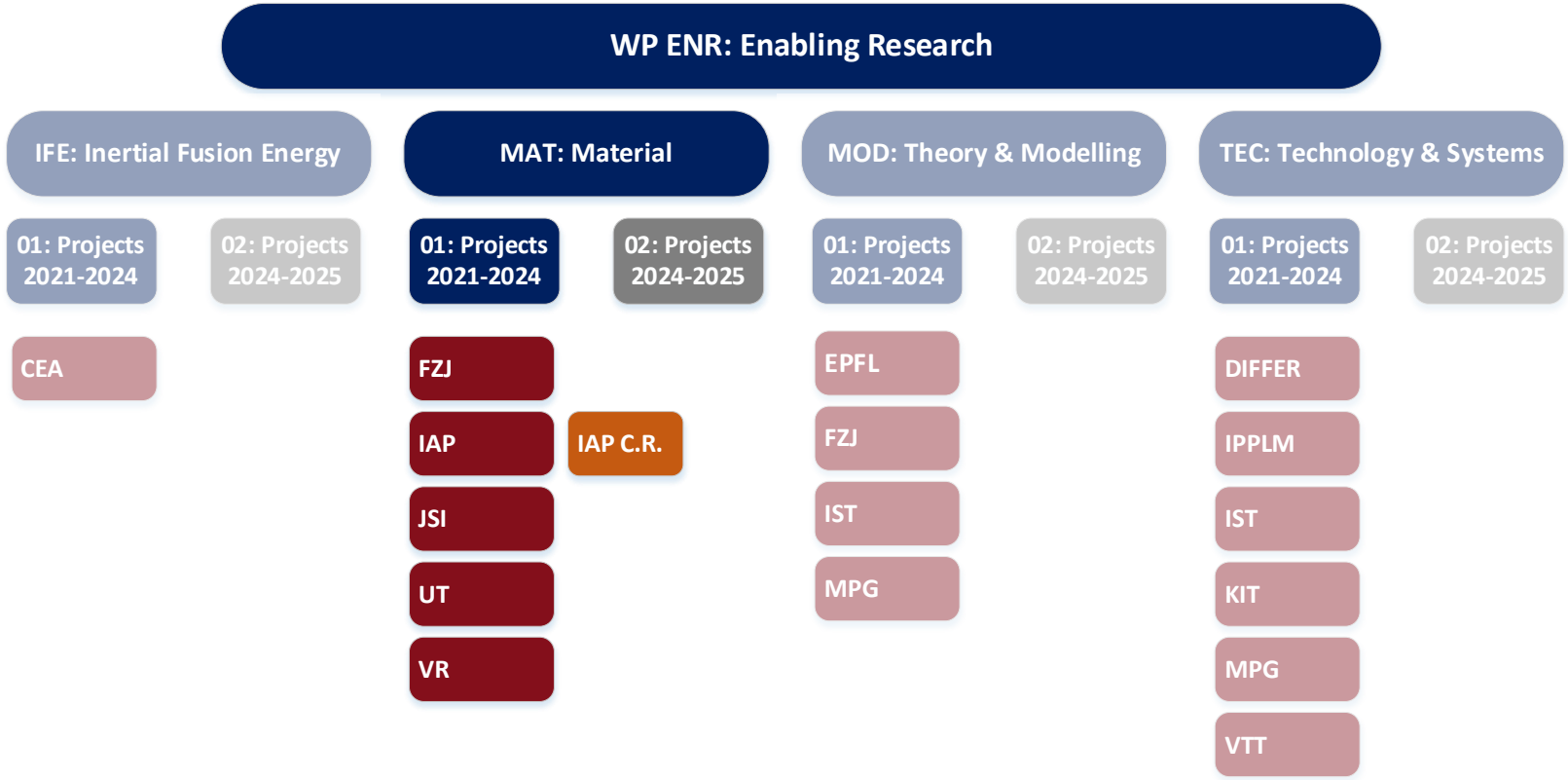
1 – WP Organization



ENR-MAT.01.IAP

Energetic particle optimization of stellarator devices using near-axis magnetic fields

- Project started in Jan.2022
- Complimentary Research

2 – WP Main Objectives & Summary of Achievements (previous year)

Late start: projects were running for 6 months in 2021

Overall progress

- Preparatory activities:
  - *Kick off (establishment of interactions within the project team)*
  - *Theory/literature reviews;*
  - *Preparatory calculations and modelling;*
- *Sample manufacturing;*
- *First sample analysis*

ENR-MAT.01.FZJ (D. Dorow-Gerspach)

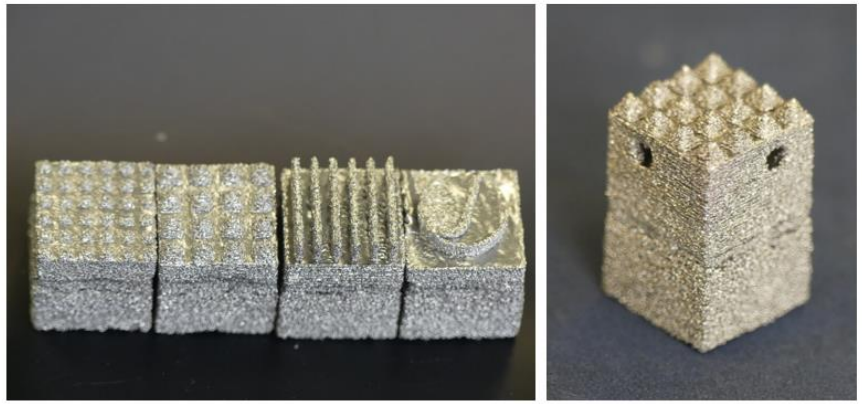
Additive manufacturing as tool to produce and maintain plasma facing components

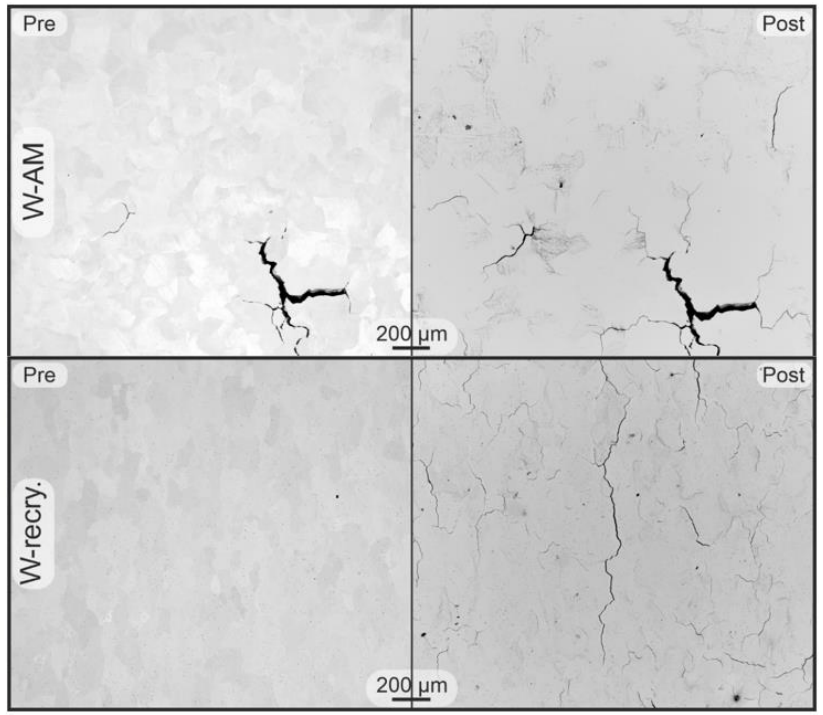
2nd SB.ENR-MAT (Monitoring of 2021 activities)
https://indico.euro-fusion.org/event/1354/
Annual report
https://idm.euro-fusion.org/default.aspx?uid=2NZNAQ

O.1. AM-W

JÜLICH Forschungszentrum

- AM-W with density > 95% was realized at IFAM Dresden with low amount of cracks
  - Fewer cracks than recry. W after 10^5 HFF 3 at 700°C
  - Advanced structures possible
- New cooperation with KIT started





- Sample manufacturing and initial tests have started

2 – WP Main Objectives & Summary of Achievements (previous year)

ENR-MAT.01.IAP (G. Dinescu)
NanoDust in Metal Tokamak (DUST-FORM)

2nd SB.ENR-MAT (Monitoring of 2021 activities)
https://indico.euro-fusion.org/event/1354/
Annual report
https://idm.euro-fusion.org/?uid=2P4NA3

2nd PWIE PB (18.11.2021)

CR1.1 Shift of the start date for the ENR-MAT.01.IAP (*NanoDust in Metal Tokamak*)
Due to significant delay on the signature of the Grant Agreement, IAP can not start activities due to internal regulations.
PI has requested (confirmed by the Beneficiary Head) to shift the **start date of the project to 1st of Jan 2022**. The end date must be within 30 Sept 2024, as it is limited by the end of the end of the national framework research programme (**shortening of the project duration**).
PI has provided revised Work Plan adjusted to the new start date.

2nd SB.ENR-MAT (01.12.2021)

Reasoned recommendations:

For the Funding Agency: In view of ITER the proposed extension of the existing capacities to conduct research with beryllium is highly recommended as IAP is one the few laboratories within EUROfusion to handle beryllium as the first wall material of ITER

For the authors of the project proposal: Proponents are encouraged to consider whether the magnetron sputter source could use Ne or He instead of Ar as the carrier gas, to make for a condensation condition where the mass of the gas/plasma is closer to a tokamak condition.

- Project start delayed (Jan.2022) due to admin reasons
- Complimentary Research project accepted by Science Ministry in Romania (extension of diagnostics)

2 – WP Main Objectives & Summary of Achievements (previous year)

ENR-MAT.01.JSI (S. Markelj)

Detection of defects and hydrogen by ion beam analysis in channelling mode for fusion

2nd SB.ENR-MAT (Monitoring of 2021 activities)
https://indico.euro-fusion.org/event/1354/
Annual report
https://idm.euro-fusion.org/?uid=2P3NNZ

DeHydroC project: 1. June 2021 – 31. May 2024

- **WP1 - The In-Situ Ion Beam Analysis in Channelling mode (INSIBA-C)**
  - T1.1 Incorporation of the goniometer in the INSIBA experimental station – JSI.
  - T1.2 Detection system for ion beam methods - JSI.
- **WP 2 - Sample production and defect characterization**
  - Task 2.1 Production of samples with dominant defects in the material – JSI and MPG.
  - Task 2.2 Characterization of defects - UHEL, JSI, MPG.
  - Task 2.3 Simulation and interpretation of C-RBS spectra - UHEL, CEA, JSI.
  - Task 2.4 In-situ C-RBS and sample heating – JSI, MPG, UHEL
- **WP 3 - Deuterium retention studies**
  - Task 3.1 Characterization of defects by D retention studies and MRE modelling - JSI, MPG, CEA, UHEL.
  - Task 3.2 Development of C-NRA method - JSI, UHEL, MPG.
  - Task 3.3 – Modelling of deuterium position in lattice/defect and identification of D position - UHEL, CEA, JSI.
- **WP 4 - Management, Dissemination, Communication and Exploitation.**
  - Task 4.1 Management.
  - Task 4.2 Dissemination, communication and exploitation:

S. Markelj – ENR monitoring meeting 18st December 2021 | Page 9

DeHydroC project: 1. June 2021 – 31. May 2024

At present samples are analysed by transmission electron microscopy (TEM) to gain complementary information to the planned positron annihilation lifetime spectroscopy (PALS) measurements. Overall the project proceeds as planned and we managed to make the first necessary steps in the DeHydroC project.

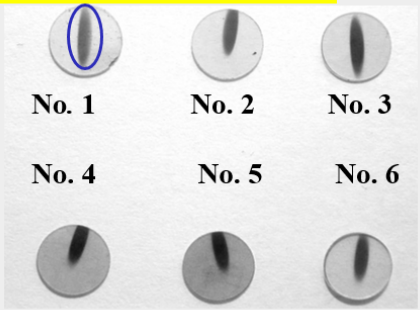
ENR-MAT.01.UT (A. Lushchik)

Investigation of defects and disorder in nonirradiated and irradiated Doped Diamond and Related Materials for fusion diagnostic applications (DDRM) – Theoretical and Experimental analysis

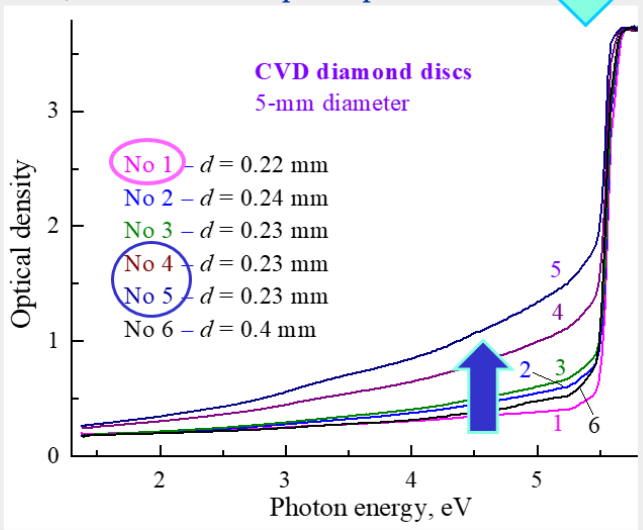
2nd SB.ENR-MAT (Monitoring of 2021 activities)
https://indico.euro-fusion.org/event/1354/
Annual report
https://idm.euro-fusion.org/?uid=2P4EA5

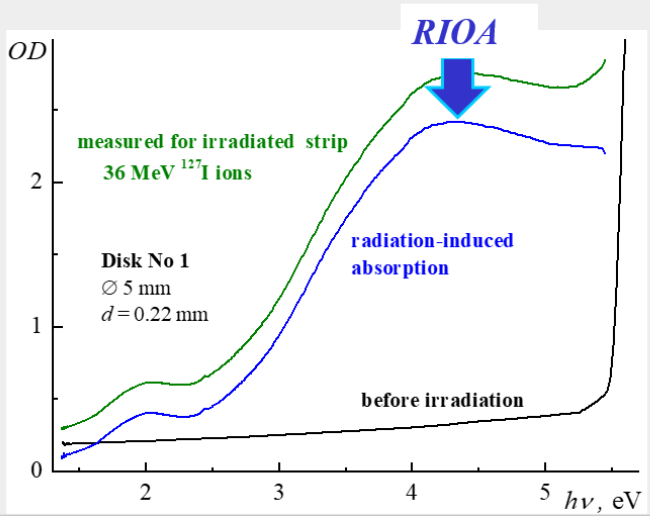
Tasks (3) and (9)…Characterization of virgin/irradiated materials (UT, ISSP-UL)

Six 5-mm-diameter discs of SVD diamond have been analyzed **before and after** irradiation with 36-MeV ^{127}I ions (Elastic Recoil Detection Analysis (ERDA) measurements using Tandem accelerator in Angström-Lab, Uppsala).



Optical absorption spectra for nonirradiated Diamond discs, JASCO-V660 spectrophotometer

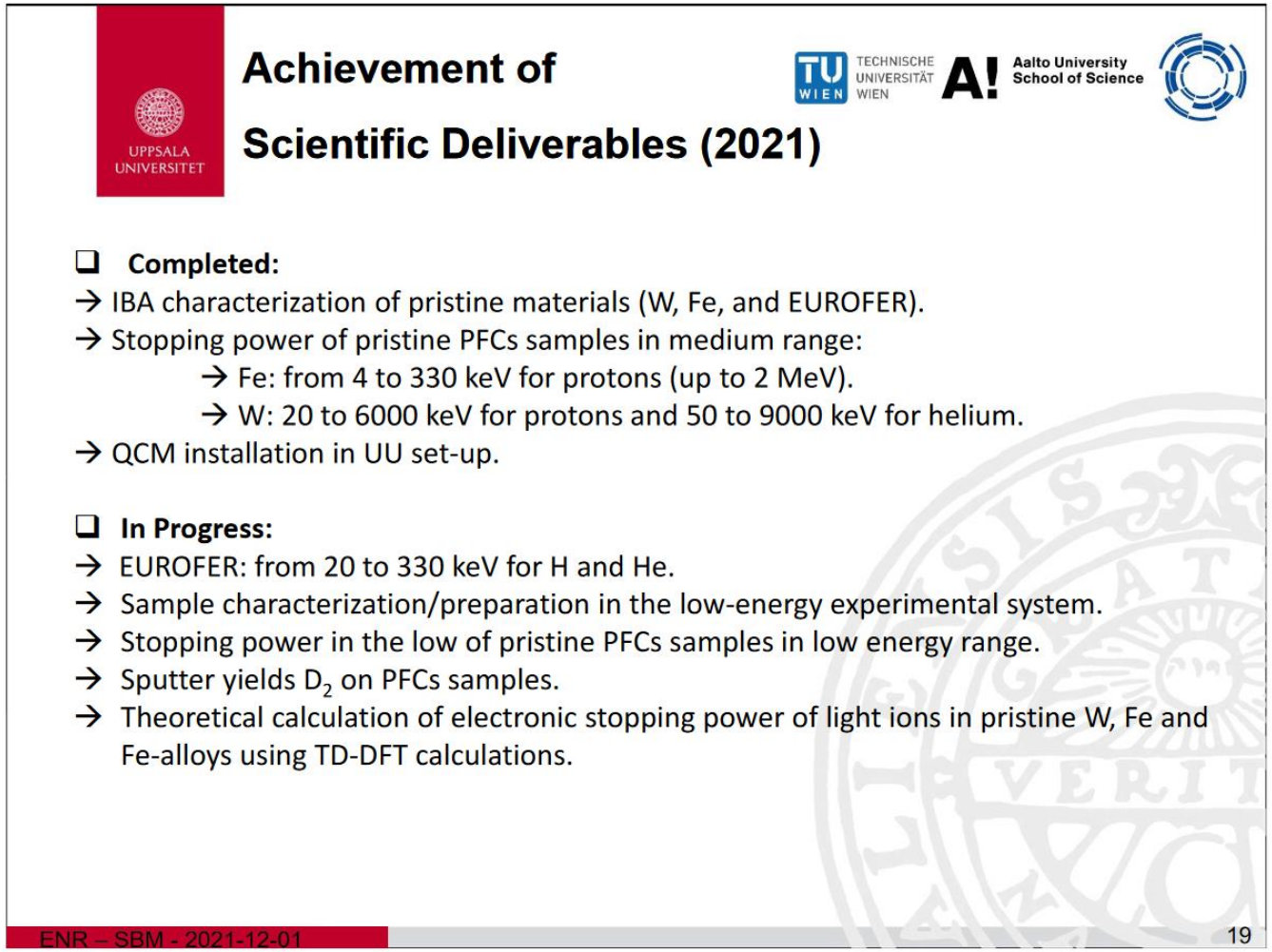




- Literature and Theoretical reviews
- Calculations of dielectric properties and Modelling of the interfacial effects
- First irradiation of the selected samples

ENR-MAT.01.VR (E. Pitthan)

Electronic interactions of slow ions and their influence on defect formation & sputter yields for plasma facing components



2nd SB.ENR-MAT (Monitoring of 2021 activities)
https://indico.euro-fusion.org/event/1354/
Annual report
https://idm.euro-fusion.org/?uid=2P4NVU

The PFCs to be employed for measurements of stopping powers were selected, prepared, and characterized. They were: i) iron foils (99.995%); ii) tungsten foils (99.9% nominal purity); iii) and EUROFER steel samples.

For experiments determining sputter yields in-situ, a quartz crystal microbalance (QCM) system was developed and assembled (in Uppsala)

First molecular dynamics simulations of sputtering yields were also performed using existing model in MDRANG (TU Wien)

2 – Status of Grant Milestones & Grant Deliverables (previous year)

GA Deliverable No.	Title	Due Date	Status	Details on Status (in case of delays or issues)
D07.01	Joint progress report on the Enabling Research projects 2021	31/12/2021	Completed	

GA Milestone No.	Title	Due Date	Status	Details on Status (in case of delays or issues)
n/a				

3 – Risk & Mitigation Register: Current Status

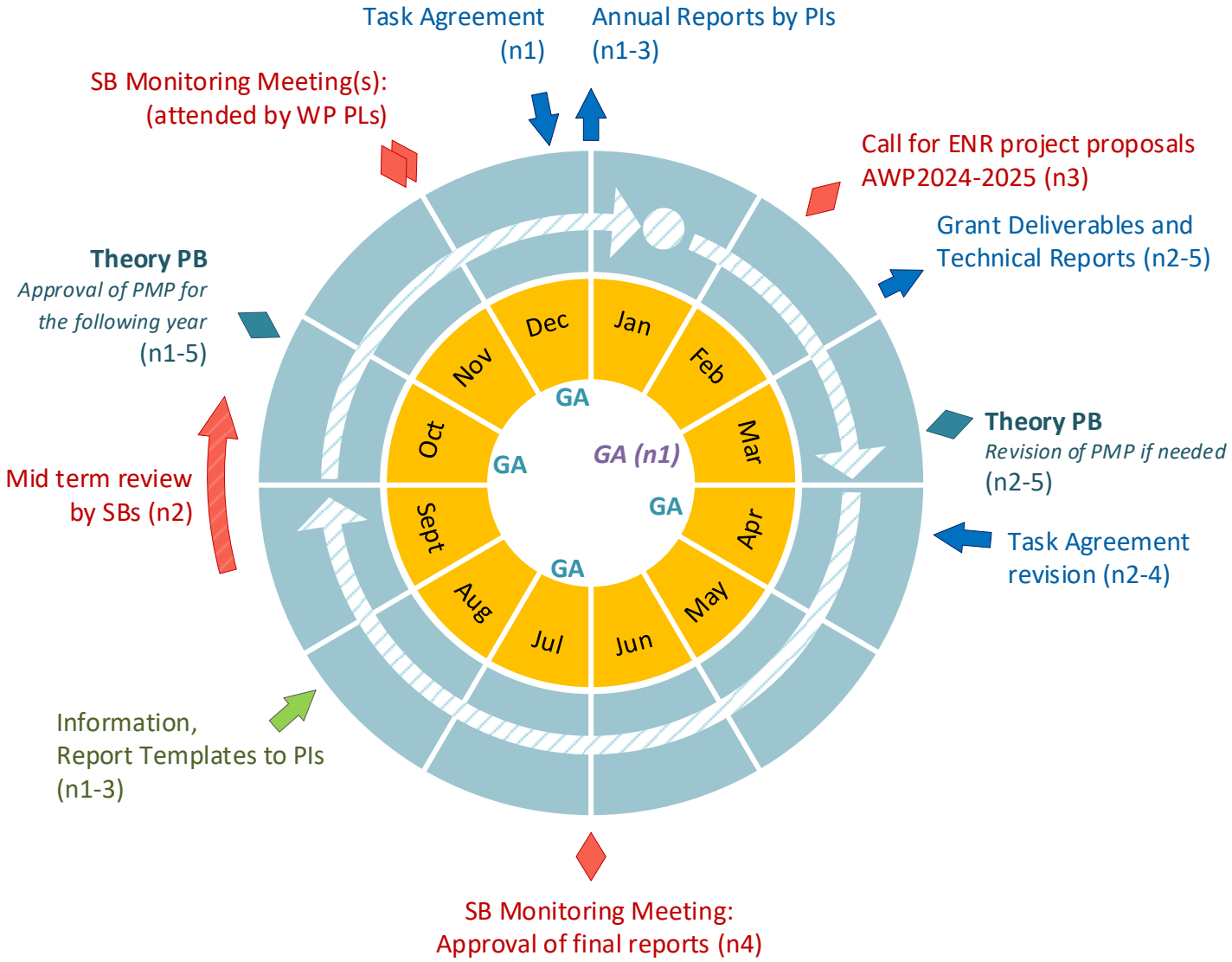
Description of Risk	Severity	Likely hood	Proposed Mitigation Action	Risk materialized ?	Mitigating Measures applied?	Comments
n/a						

4 – Project Change Requests & Other Items for Decision/Approval by PB

Decisions on PCRs

PCR Number	PCR Title	PCR Status	Comments
CR1.1	Shift of the start date for the ENR-MAT.01.IAP (NanoDust in Metal Tokamak)	**Approved** by 2nd PB (18.11.2021)	Due to significant delay on the signature of the Grant Agreement, IAP can not start activities due to internal regulations. PI has requested (confirmed by the Beneficiary Head) to shift the **start date of the project to 1st of Jan 2022**. The end date must be within 30 Sept 2024, as it is limited by the end of the end of the national framework research programme (**shortening of the project duration**). PI has provided revised Work Plan adjusted to the new start date.
CR1.2	Replacement of the Principal Investigator of ENR-MAT.01.IAP (NanoDust in Metal Tokamak)	**Approved** by 2nd PB (18.11.2021)	Flavian Stokker Cheregi has left the IAP, it is proposed to replace the investigator for this project by **Gheorghe Dinescu**. George was foreseen as a senior team member already by the original proposal.
CR2	Replacement of the Principal Investigator of ENR-MAT.01.VR (Electronic interactions of slow ions and their influence on defect formation & sputter yields for plasma facing components)	**Approved** by 2nd PB (18.11.2021)	Due to private reasons current PI (Marcos Moro) must leave Uppsala university and can not continue as the project PI. **New PI (Eduardo Pitthan)** has been proposed.

5 – AOB (including lessons learnt)



At the end of 2022 the **Mid-term Review** of projects will be done by **SBs**

End of PB-Presentation slides