PRODUCTION OF B REFERENCE LAYERS FOR ISOTOPIC EXCHANGE STUDIES

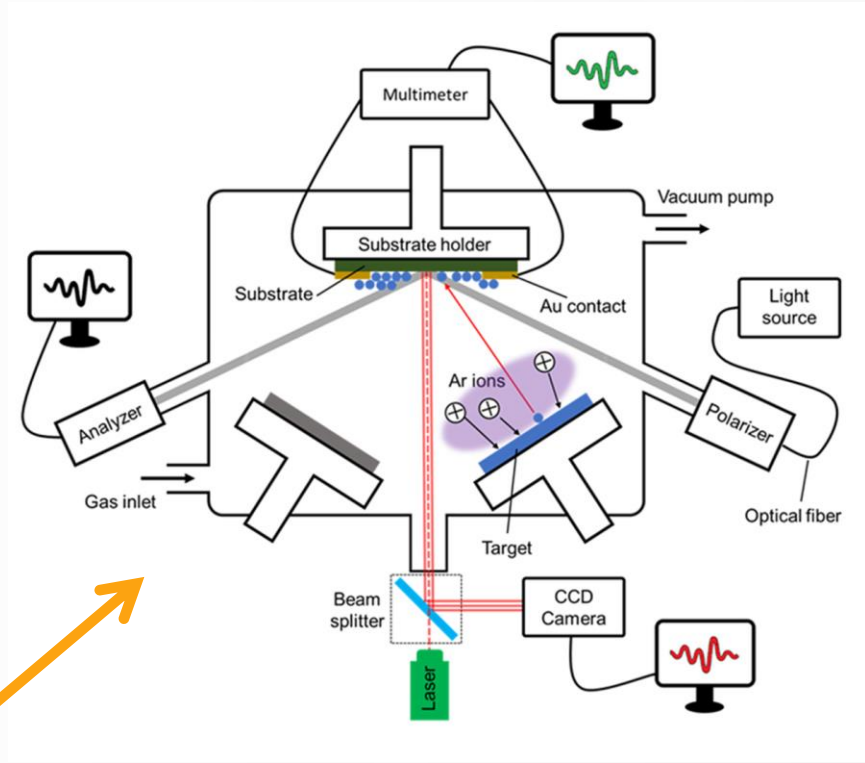
SP B kick-off meeting 2026

Tomi Vuoriheimo
University of Helsinki / VTT

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.

2026 & 2027 PLAN

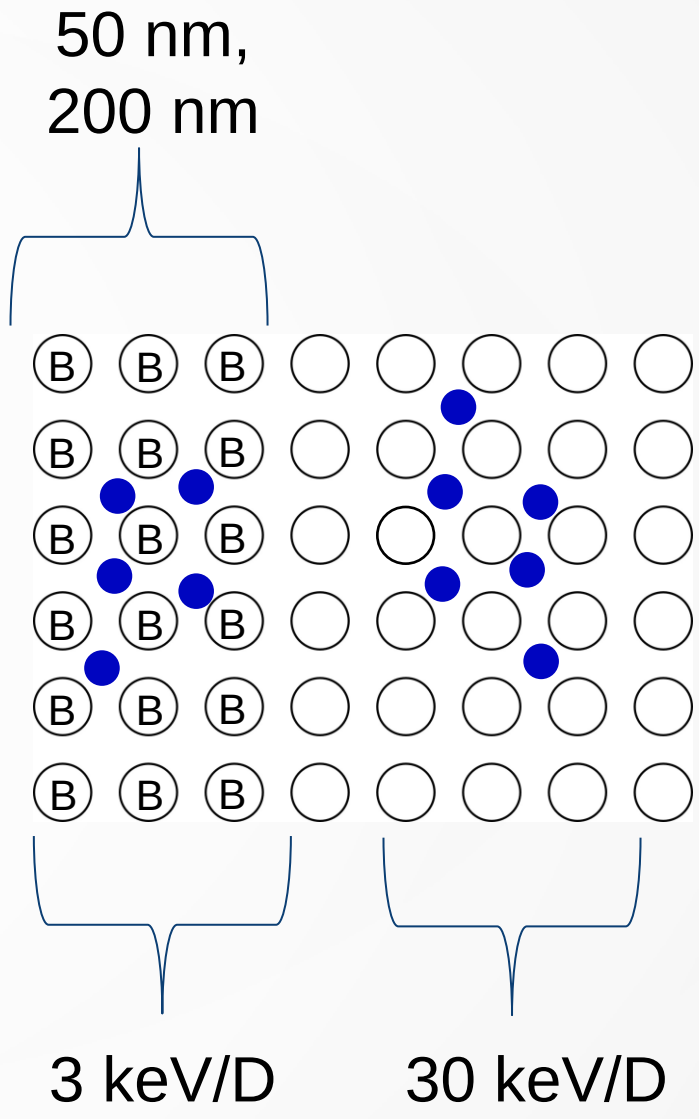
- SP B.2 [Material migration in toroidal and linear plasma devices]
  - (Collab.) Surface analyses (RBS, NRA, ToF-ERDA) for samples exposed to AUG plasmas (erosion profile) [2026]
  - (Collab.) Surface analyses (RBS, NRA, ToF-ERDA) for samples exposed to AUG plasmas (deposition patterns of B and D) [2027]
- SP B.3 [Reference coatings for ITER and fusion pilot plant]
  - (**Ongoing**) Production and characterization of reference B coatings for investigating their isotope-exchange capabilities (ERG grant project) [2026]
  - (Upcoming) Production and characterization (including SIMS, RBS, NRA, TOF-ERDA) of reference B coatings for investigating in real time generation and evolution of stresses in the growing films [2027]



EFFECT OF B LAYER ON HYDROGEN ISOTOPE EXCHANGE IN TUNGSTEN

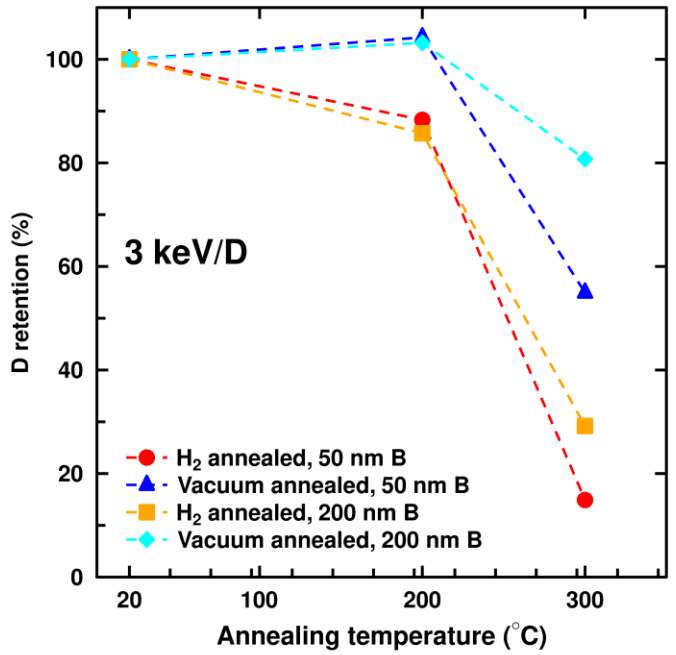
- Objective: How does B layer on W affect hydrogen isotope exchange efficiency?

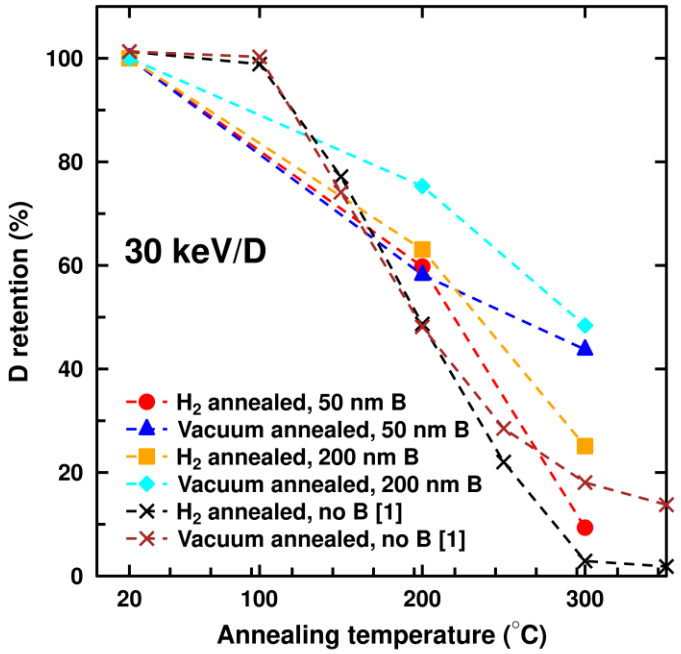
1. 2 different B layer thicknesses: 50 nm and 200 nm
2. D implantations with 2 energies: 3 keV/D and 30 keV/D
   - 3 keV/D goes into B layers
   - 30 keV/D goes past B and into W
3. Annealing in H_2 atmosphere and in vacuum
   - 200°C and 300°C
4. ERDA (done, poster at PSI) and TDS (upcoming)



EFFECT OF B LAYER ON HYDROGEN ISOTOPE EXCHANGE IN TUNGSTEN

- Objective: How does B layer on W affect hydrogen isotope exchange efficiency?
- Main conclusions:
  - Very small changes in D retention inside B at 200°C
  - 2 main trends at 300°C:
    - H_2 atmosphere annealing still reduces D inventory more than vacuum annealing
    - 200 nm B layer hinders D removal more than 50 nm B layer
  - B layers reduce the efficiency of D removal





[1] T. Ahlgren *et al* 2019 *Nucl. Fusion* **59** 026016