Update and Plans IFPILM

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Plan for 2023

2022

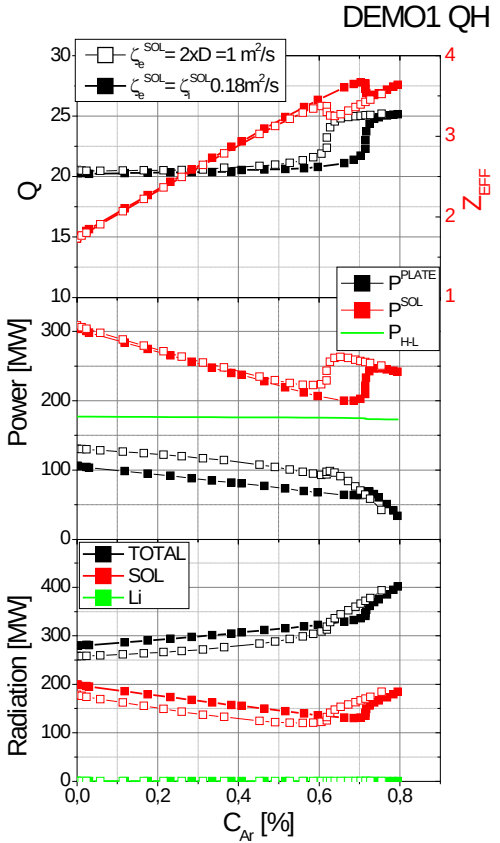
Simulations of LD (Li, Sn) for DEMO-QH version 2019 with COREDIV and TECXY code

In report was presented analysis for only Sn, but we continue the work for Li. Simulation for Li was prepared.

2023

15th International Symposium on Fusion Nuclear Technology (ISFNT-15), 10-15.09.2023

V. Pericoli Ridolfini et al., *On the compatibility of liquid metal divertor targets with the EU-DEMO performances*



Plan for 2023

PRD-9.INT.01-T011-D001: Numerical evaluation of LM-CPS performance in COMPASS-U

Starting to collaboration with Jan Horacek and F. Jaulmes

Preparing numerical analysis applied to COMPASS Upgrade simulated discharge by Fiesta+METIS [1] and the plasma-liquid-divertor interaction by HeatLMD [2] for case B_t = 2.5 T, I_p = 0.8 MA using the COREDIV code, which self-consistently solves 1D radial transport equations for plasma and impurities in the core region and 2D multi-fluid transport in the SOL.

1. F. Jaulmes et al., *Modelling of charge-exchange induced NBI losses in the COMPASS upgrade tokamak,* Nucl. Fusion **61** (2021) 046012 (18pp) presented different scenarios for COMPASS-U
2. J. Horacek et al Phys. Scr. 96 (2021) 124013

Aim of the simulation

Aim answer the questions:

- How much is Li and Sn concentration?
- How much Li and Sn influenc of the W sputtering?
- What is the Z_{eff} and radiatior profiles?
- How much radial tranport in SOL influence of the global plasma parameters?

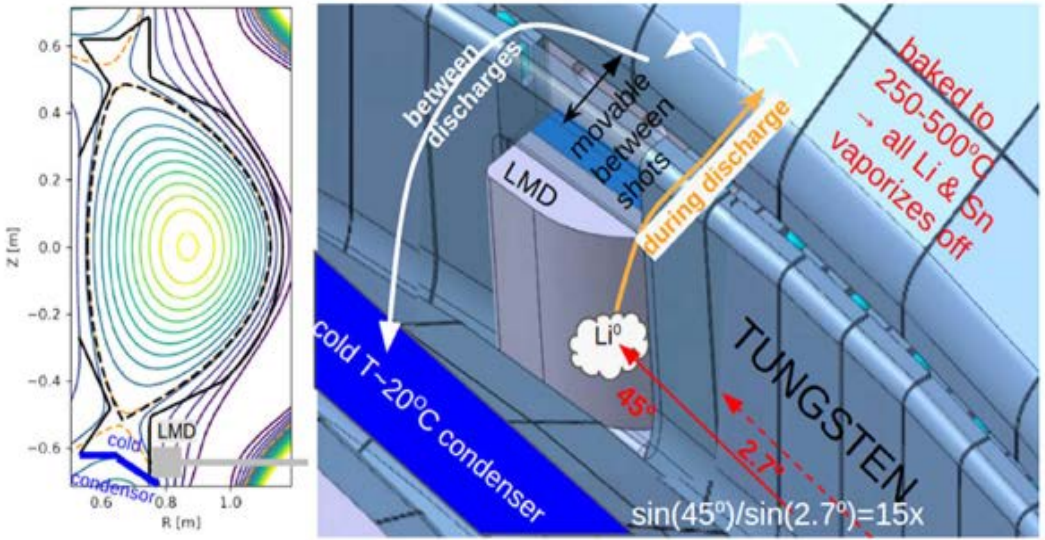


Figure 2. Left: Cross-section of the COMPASS-U tokamak with the LMD target at the bottom. Right: The CPS LMD target in divertor. Inserting just 1 cm deeper implies 15× steeper incident angle than on the surrounding tungsten tiles. The evaporated Li/Sn condensates at nearby PFCs kept at 350 °C–500 °C. Li then many times evaporates and redeposits until it finally condensates at a dedicated room-temperature plate in the private flux region. Since Sn doesn't evaporate at such a low temperature, sputtering e.g. by Argon glow discharge is considered.

J. Horacek et al Phys. Scr. 96 (2021) 124013

Simulation for # 3210 with P_{aux} = 2 MW

The simulation are prepared for COMPAS configuration –scenarios A.

PARAMETERS	
Toroidal radius: R [m]	0.9
Plama radius: a [m]	0.27
Plasma currents: I_p [MA]	0.8
Toroidal Mag. Field: B_T [T]	2.5
Elongation	1.7
Electon density: $<n_e>$vol[x$10^{20}$$m^{-3}$]	0.815
Auxiliary heating: P_{aux} [MW]	2.0

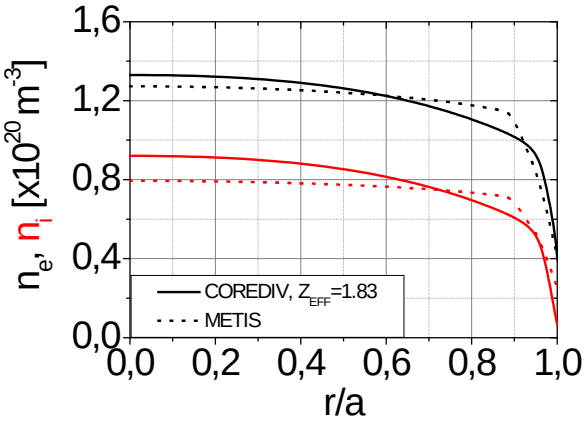
We assuming:

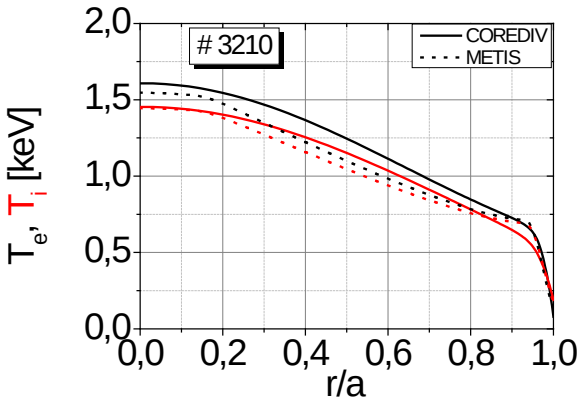
- $n_e^{sep} = 0.35<n_e>_{vol}$
- $H_{98} = 1.0$
- $R^{recyc}_{Li,Sn} = 0.1$
- $D_{SOL} = 0.5$ m^2/s
- W divertor

Choice of impurities

- Self - consistent simulations with 3 impurities:
  - C – fixed source at midplane, chosen to fit Z_{eff} (Z_{eff} = 1.3)
  - Li, Sn - fixed source at divertor plate
  - W – from sputtering (all ions)
- The radiation and Z_{EFF} levels fitted **simultaneously**

Simulation for # 3210 with P_{aux} = 2 MW





2023

15th International Symposium on Fusion Nuclear Technology (ISFNT-15), 10-15.09.2023

or

PLASMA 2023
International Conference on Research and Applications of Plasmas, 18-22.09. 2023