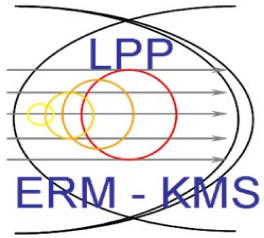
ECWC Modelling on JT-60SA

Johan Buermans



EUROfusion

johan.buermans@ugent.be

May 4, 2022

Overview

Introduction

Aim of Electron Cyclotron Wall conditioning

- Keep up the plasma performance throughout an experimental day/week while the superconducting coils remain energized
- Glow discharge conditioning is not operable in the presence of magnetic fields
- ECRH plasma will be used for wall conditioning and breakdown assistance

Objectives

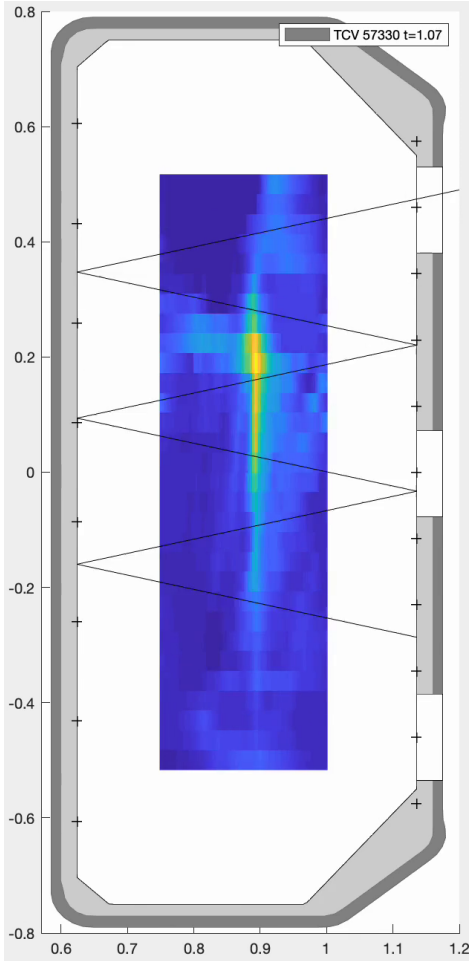
- Understand how ECRH plasma production works in JT-60SA
- Assess the Wall Conditioning possibilities
- Assess the role for ECWC in JT-60SA

WPSA Project Planning Meeting 2021: Presentation Tom Wauters

ECRH plasma production

ECWC model to complement experimental observations: TOMATOR-1D

- **Aim:** Assess the role of multi-pass absorption and absorption efficiency
- **Input:** Experimental He/H_2 pressure, experimental density profile, vessel dimensions, toroidal and poloidal magnetic field
- **Output:** Transport coefficients and absorption
- **Tools:**
  - Tomography of JT-60SA EDICAM images
  - Plasma emissivity profiles as input for the model



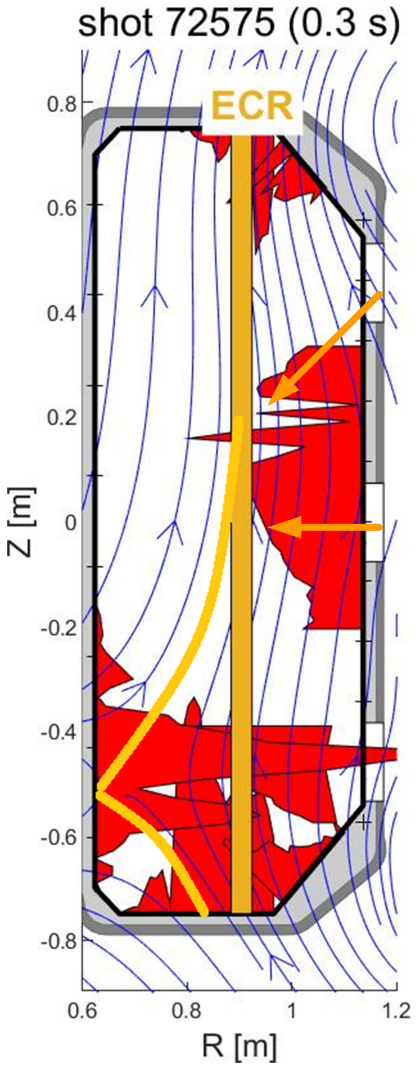
Wall Conditioning possibilities

Maximize plasma wetted area

- By applying poloidal fields
- Asses the plasma wetted areas by poloidal emissivity maps ⇒ Tomography
- Model the vertical and horizontal particle losses with TOMATOR-1D

Localized cleaning

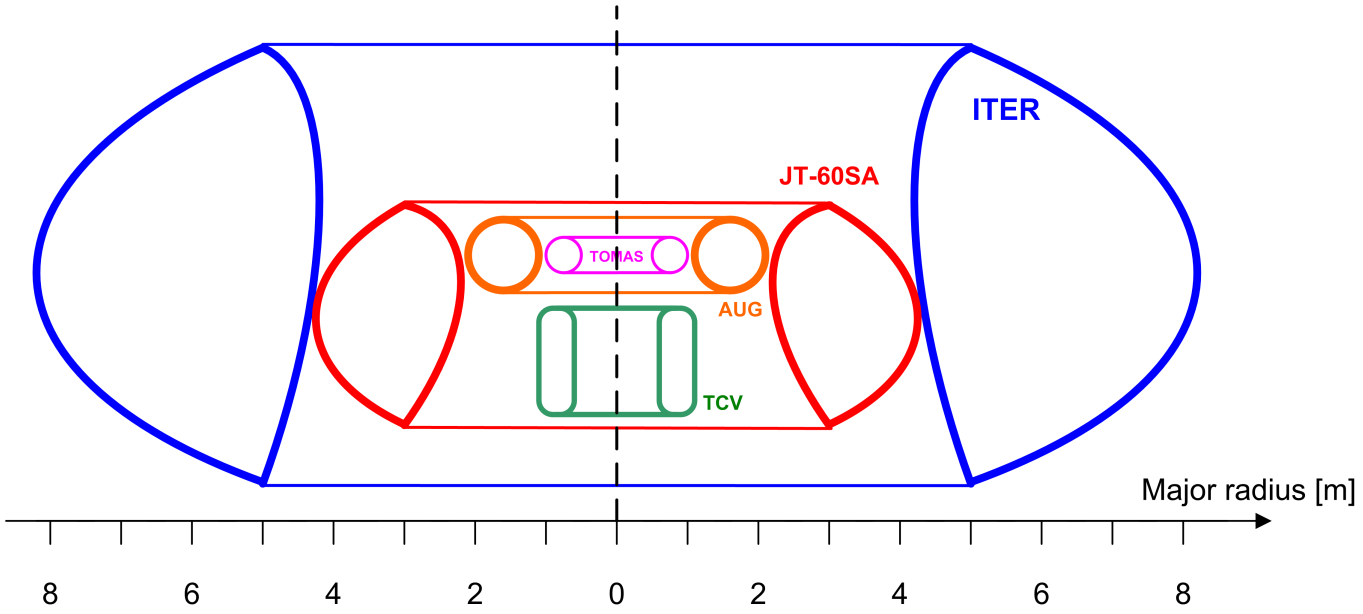
- By applying specific field maps
- Reach HFS and divertor area with a high particle flux
- Relevant for T removal at inner divertor baffle and impurity removal from HFS wall (ITER)



Workplan

Work Plan

1. Analysis of experimental data and modeling from other machines
2. Analysis of wall conditions during JT-60SA commissioning
3. Modeling of ECWC to complement experimental observations
4. Projection of ECWC experience to ITER



Workplan

Analysis of experimental data and modeling from other machines

- Benchmarking TOMATOR-1D code
- Insight on transport processes $\Rightarrow$ Particle fluxes to HFS and LFS
- Required coupled power to equilibrate the power balance $\Rightarrow$ Estimation of stray radiation

Analysis of wall conditions during JT-60SA commissioning

- Assess the role for ECWC in JT-60SA
- Support development and optimization of ECWC procedures in JT-60SA
- Camera tomography to assess EC interaction and plasma uniformity
- Mass spectroscopy, optical penning gauge, plasma spectroscopy assistance

Workplan

Modeling of ECWC to complement experimental observations in JT-60SA

- Insight on transport processes $\Rightarrow$ Particle fluxes to HFS and LFS
- Required coupled power to equilibrate the power balance $\Rightarrow$ Estimation of stray radiation
- Camera tomography will complement plasma diagnostics as input for TOMATOR-1D model

Projection of ECWC experience to ITER

- e.g. power requirement, stray radiation, lessons from routine ECWC operation

ECWC Modeling on JT-60SA

Questions ?

Thanks to

R Ragona, T Wauters
J Cavalier, J Svoboda