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P18

A methodology for thermo-mechanical assessment of in-box LOCA events on fusion blankets and its application to EU DEMO HCPB breeding blanket

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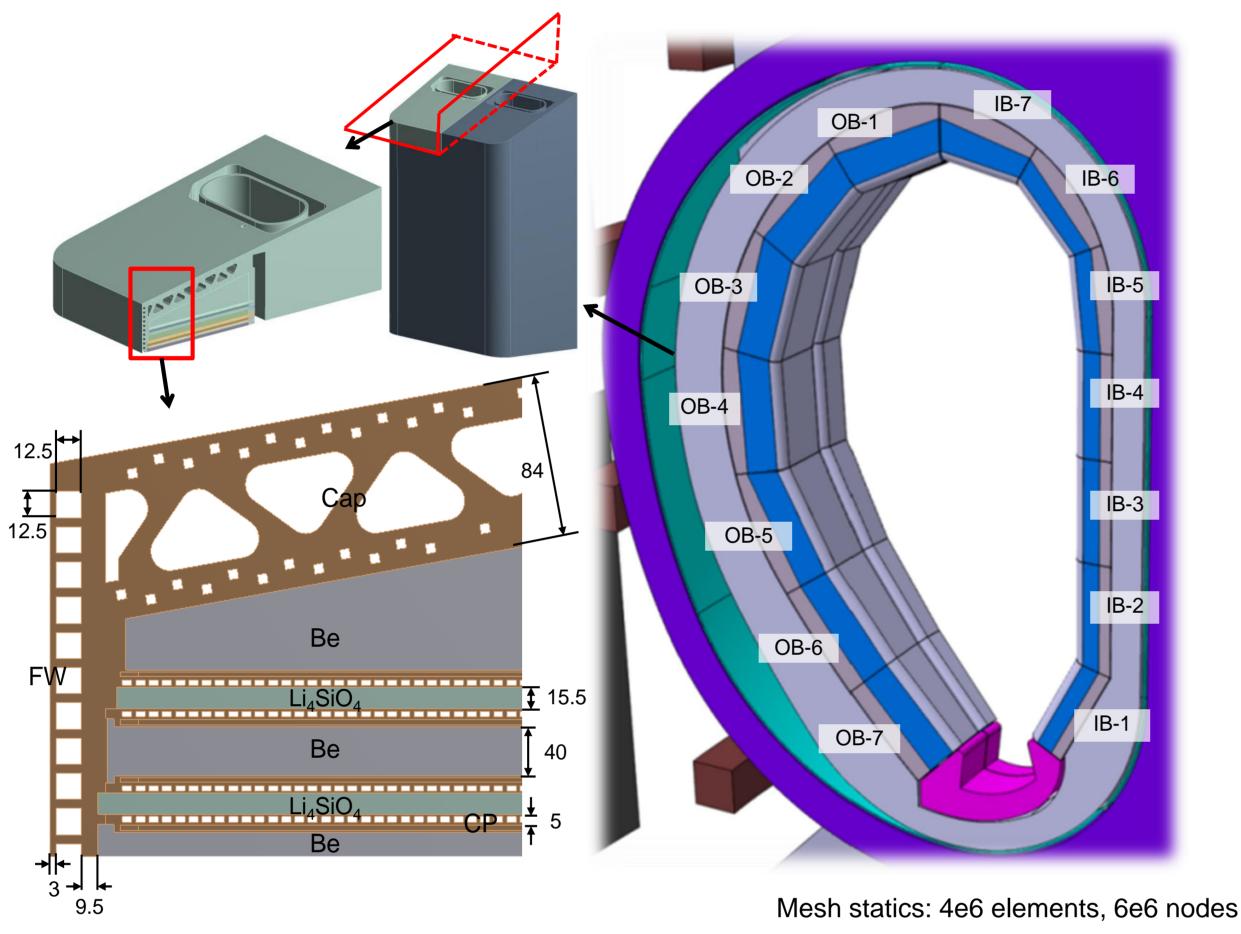
Introduction

- A 3D model of EU DEMO HCPB breeding blanket has been developed for transient thermal analysis and structural analysis.
- Temperature evolution and stress field of HCPB breeding blanket under an in-box LOCA are obtained.
- New methodology is proposed for the thermo-mechanical assessment of HCPB breeding blanket under an in-box LOCA.

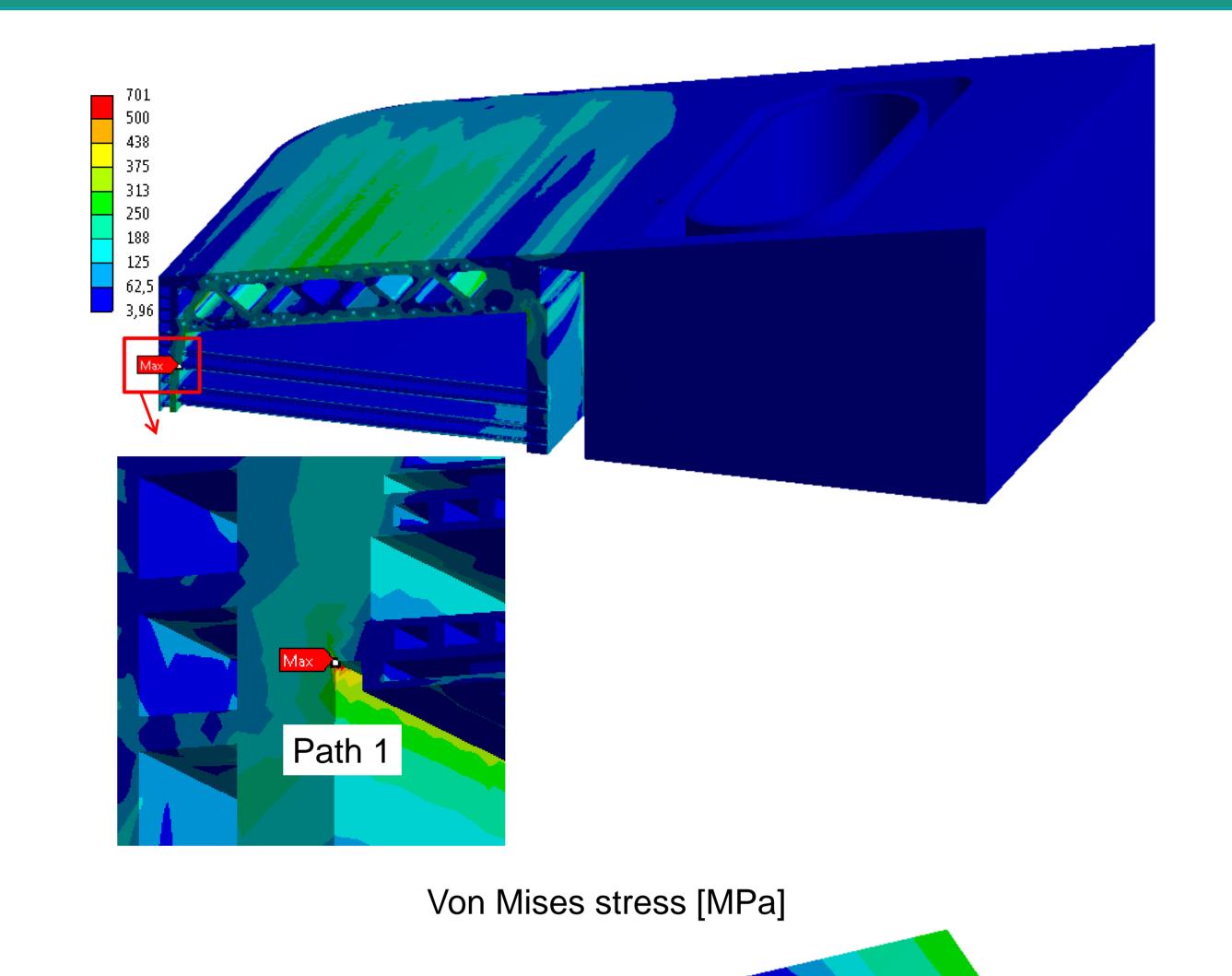
FEM Models

Results and Analysis

Geometry & Boundary conditions







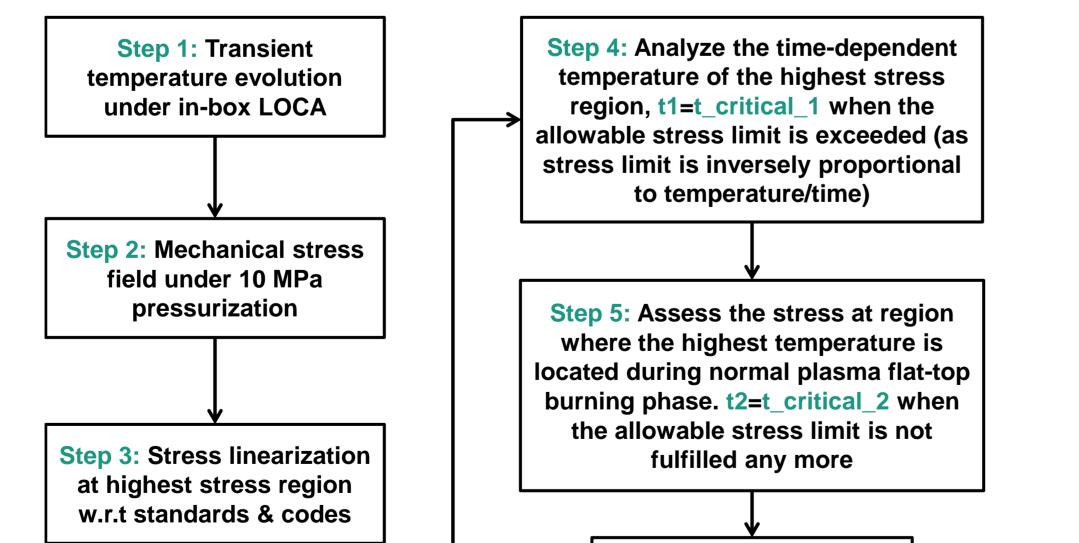
Transient thermal analysis

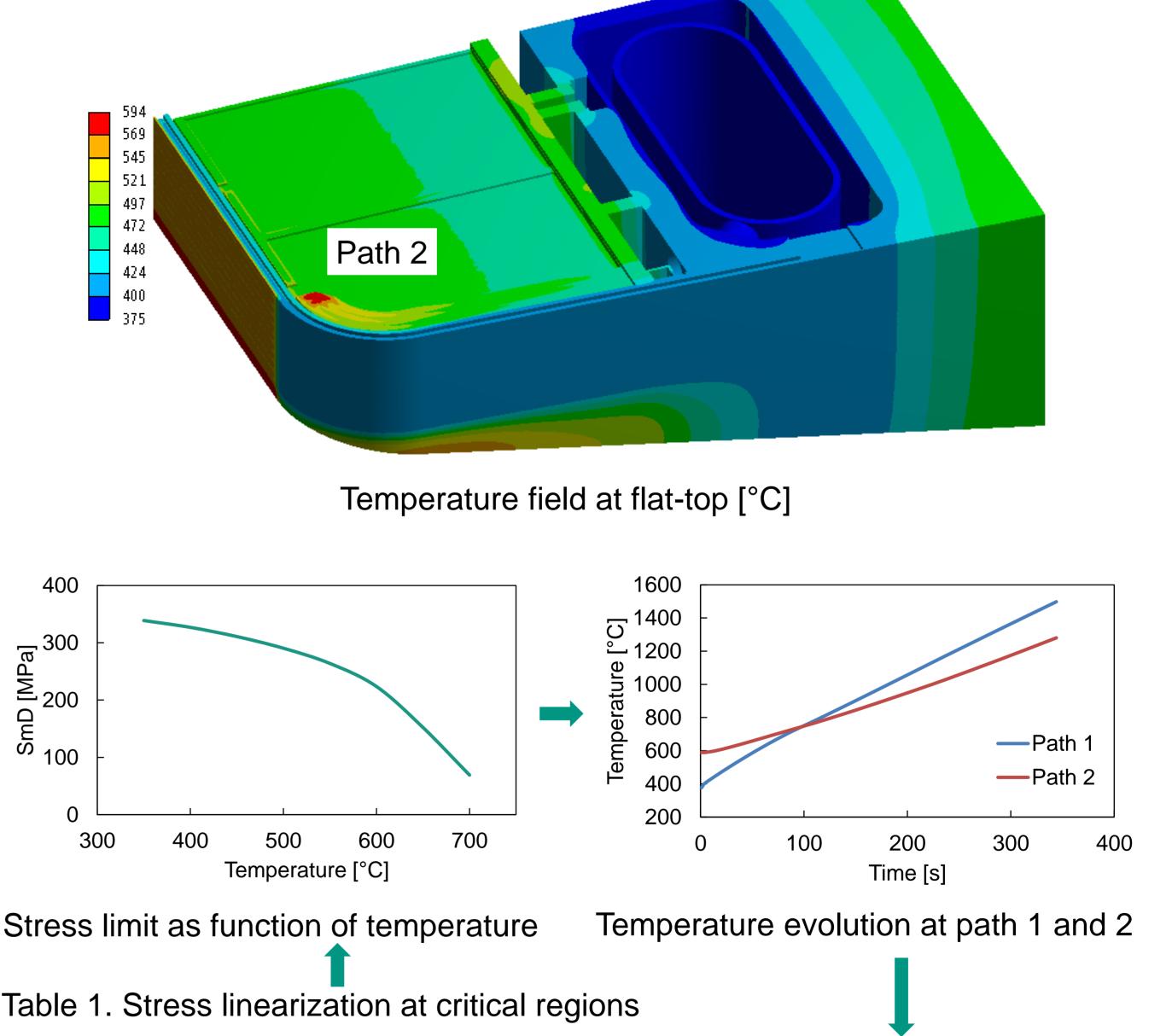
- Heat flux: 0.5 MW/m²
- No action is taken, when In-box LOCA occurs
- Thermal radiation from BLK to VV, only heat sink

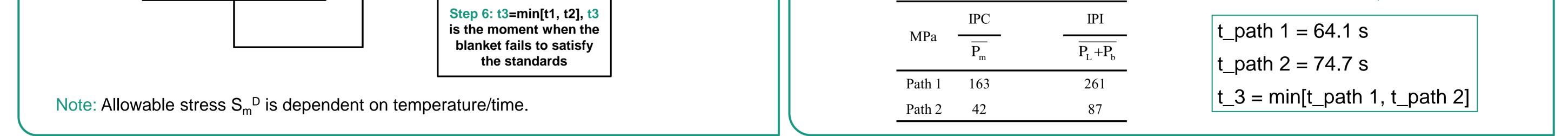
Mechanical analysis

- Level D criteria, only P stress considered (RCC-MRx)
- 10 MPa applied on coolant channels, inner surfaces from inside blanket box

Proposed methodology







Conclusions

- Temperature evolution and stress field of EU HCPB breeding blanket under an in-box LOCA event are obtained by using ANSYS.
- New methodology is proposed and applied for the thermo-mechanical assessment of HCPB breeding blanket under an in-box LOCA.
- HCPB breeding blanket can survive the in-box LOCA up to about 64 s without mitigation action, which is long enough to trigger plasma shutdown.

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