Contribution ID: **736** Type: **not specified**

P2.165 On the effect of stiffening plates configuration on the DEMO Water Cooled Lithium Lead Breeding Blanket module thermo-mechanical behaviour

Tuesday, 18 September 2018 11:00 (2 hours)

Within the framework of the pre-conceptual design of the EU-DEMO Breeding Blanket (BB) supported by EUROfusion action, the University of Palermo is involved, as ENEA linked third-party, in the development of the Water Cooled Lithium Lead (WCLL) BB concept.
Results of the research activities carried out have highlighted that changes in the proposed WCLL BB design have to be considered, especially as to liquid breeder circulation path within the BB module. In particular, the suppression of breeder manifolds in the back supporting structure has pushed the WCLL BB design team to find an alternative solution, potentially relying on the snake-like radial circulation of liquid breeder through horizontal cells delimited by toroidal-radial Stiffening Plates (SPs), alternatively opened in their front and back side, respectively.
Therefore, in view of the definition of a final WCLL BB module layout, a parametric campaign of analyses has been carried out at the University of Palermo to assess the impact of different SPs configurations on the module thermo-mechanical performances. To this purpose, attention has been focussed on the three horizontal cells located in the outboard module equatorial region and the thickness and pitch of both vertical and horizontal SPs, as well as the radial width of horizontal SPs openings have been considered as parameters to be investigated. A Python script has been set-up to generate the ~300 models reproducing the three horizontal cells considered, perform calculations and post-process results. The Over-Pressurization (OP) accidental scenario, reproducing an in-box LOCA and mainly characterized by a uniform pressure of 18.6 MPa acting onto all water and breeder wetted surfaces has been assumed as the reference loading scenario.
The study has been carried out following a theoretical-numerical approach based on the Finite Element Method (FEM) and adopting the Abaqus FEM code. Results obtained are herewith reported and critically discussed.

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Session Classification: P2