**SOFT 2018** 



Contribution ID: 742

Type: not specified

## P2.171 On the effects of the Double-Walled Tubes lay-out on the DEMO WCLL breeding blanket module thermal behaviour

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

Within the framework of the EUROfusion project activities concerning the EU-DEMO Breeding Blanket (BB), University of Palermo is long-time involved, in close cooperation with ENEA, on the design of the Water-Cooled Lithium Lead (WCLL) BB, which is currently under consideration to be adopted in the EU-DEMO reactor.

The WCLL BB concept foresees liquid Pb-15.7Li eutectic alloy as breeder and neutron multiplier, whereas pressurized subcooled water as coolant, with operative conditions typical of the PWR fission reactors (temperature in the range of 295-328 °C and pressure of 15.5 MPa). The cooling down of the BB is guaranteed by means of two separated cooling circuits: the one consisted in square channels housed within the complex of Side Walls and First Wall, where counter-current water flow takes place, and the one composed of a set of Double-Walled Tubes (DWTs) submerged in the Breeder Zone (BZ) and deputed to remove heat power therein generated.

A parametric thermal analysis has been carried out in order to optimize the DWTs lay-out within the BZ of the WCLL BB outboard equatorial region ensuring that EUROFER components maximum temperature stays below the allowable value of 550 °C while the overall rise of coolant temperature complies with the design requirement of 33°C. In particular, the parametric study has been focussed on the assessment of the best DWTs configuration in terms of number, disposition and orientation (vertical and/or horizontal).

The analysis has been performed following a theoretical-numerical approach based on the Finite Element Method (FEM) and adopting the ABAQUS qualified commercial code.

In the paper, results obtained together with the main assumptions adopted in the parametric analysis are critically discussed and a new, sustainable DWTs configuration is proposed.

**Presenter:** FORTE, Ruggero (Dipartimento di Energia Ingegneria dell'Informazione e Modelli Matematici (DEIM) universit<sup>^</sup> degli Studi di Palermo)

Session Classification: P2