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## Thermal hydraulic analysis for one water cooled blanket module of CFETR based on RELAP5

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The Water Cooled Ceramic Breeder blanket (WCCB) is one of the blanket candidates for Chinese Fusion Engineering Test Reactor (CFETR). The conceptual of WCCB for CFETR under 200MW fusion power has been designed based on pressurized water cooled reactor (PWR) technology. RELAP5 code, which is mature and often used in transient thermal hydraulic analysis in PWR reactor, is selected as the simulation tool. In this paper, the nodal model for RELAP5 is developed corresponding to typical WCCB module, i.e. the coolant passages inside the module were nodalized as hydrodynamic components and the associated module components were simulated with one dimensional heat structures. The steady state characteristic under full power is analyzed. The stable fluid and wall temperature distributions and pressure drops are studied. The results are agree with those of the two dimensional CFD analysis by FLUNET. Furthermore, the transient characteristics under three accidental scenarios, in-vessel loss of coolant accident (LOCA), in-box LOCA and ex-vessel LOCA, are analyzed, respectively. Simulation results show all the temperature of structure wall are within the design limitation and the decay heat can be removed by radiation heat transfer in the three LOCA scenarios, also the pressure of the related volume is within the limits.

## Eligible for student paper award?

Yes

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