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# Cooling concepts for CFETR divertor target

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The China Fusion Engineering Testing Reactor (CFETR) aims at bridging the gap between ITER and DEMO. Its scientific mission is to produce fusion power of 200 MW with tritium self-sustention and duty cycle of 0.3-0.5. The big fusion power and the auxiliary heating power of 100-140 MW, makes the design of CFETR divertor challenging. Previous work focuses on the plasma configuration and the first round engineering conceptual design, in which the divertor target employs the ITER-like water-cooled W/Cu monoblock. However, this W/Cu concept is only feasible for the operation phase I when the neutron dose level is comparable with ITER. While in operation phase II, the neutron dose level is much higher, evaluated as 5 dpa/year in the divertor. As a result, the high activation of CuCrZr heatsink prevents the use of W/Cu concept. Therefore, new cooling concepts are being studied.

The first updated one is still based on the W/Cu concept, whereas the CuCrZr is replaced by the China Low Activation Martensitic steel (CLAM). Unfortunately the low thermal conductivity of CLAM, ~28 W/(mK), drastically decreases the heat loads capability. After optimization of geometrical parameters of the monoblock, with proper hydraulic parameters the structure can afford 10 MW/m2 heat flux in steady state. In addition, a novel concept was proposed that with tungsten alloy WL10 as heatsink and FLiNaK molten salt as coolant. The initial designed divertor target is a 5 mm thick tungsten tile brazed onto a 1 mm thick filleted rectangle WL10 heatsink. Based on thermo-hydraulic and mechanical calculations, with proper hydraulic parameters the design can sustain steady state heat loads higher than 10 MW/m2. The detailed design and main calculation results are presented in the paper.

## Eligible for student paper award?

No

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