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P4.120 CFETR Integration Design Platform: Workflow for geometry design of divertor target

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In future fusion reactor, divertor is a key component where large heat flux from the confined plasma need to be exhausted. In CFETR Integration Design Platform, where the unified environment for both physics and engineering design is provided, a workflow is developed for the design of the geometry of divertor targets. According to the 0-D design and equilibrium of the designed plasma shape, the workflow is driven by geometry parameters of divertor targets including distances between the strike point and X point and incline angles for both inner and outer targets. Edge plasma is then simulated to predict the heat flux onto divertor targets by using B2.5, where neutral fluid model is adopted to speed up the workflow. The inputs for B2.5 are set based on plasma density, effective charge number and power into scrape-off layer (SOL) from 0-D design and the predicted SOL width by scaling law. The response surface of peak heat flux on the driven parameters can be then built, as well as further optimization can be performed by using OPTIMUS software. The engineering restrictions due to space requirement and minimum intersection angle between B-field line and divertor target can also be introduced in the optimization. Based on the CFETR (R=5.7 m) design, the workflow is demonstrated for a reasonable and effective geometry design of divertor targets.

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