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P4.123 DEMO First Wall misalignment study

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Within the DEMO first wall 3-D shape design activity the first study of the effect of misalignment has started. Such assessments have been conducted in the past for ITER and penalty factor maps have been created; this route could be a feasible approach in the case of DEMO wall design also. This paper details the first set of computational tests that have been carried out for DEMO. The test cases focus on the steady-state plasma operation (flat top). The aim is to understand the effect of basic misaligned cases, for example, radial protrusion/recession or poloidal rotation of a single module. To do so 3-D particle tracing software codes such as SMARDDA and PFCflux have been used to create heat flux maps that reach the first wall surfaces. The obtained heat flux maps combined with the specified radiative heat load are used as input for simplified FE models of the blanket modules. As a result, not only the effect of misalignment on heat flux, but also on the temperature and stress distribution can be estimated.
The paper describes the test matrix that has been studied and shows how the obtained results can be implemented in ANSYS in the identified critical cases. The results obtained from the nominal heat flux map are compared to the misaligned cases. The peak temperature mitigating effect of 3-D heat conduction is discussed. This work paves the way to assess more realistic combined misaligned cases (such as misalignment from different thermal expansion, or due to electromagnetic loads etc. of neighbouring blankets) in the future. Differences of single-module and multi-module segments in terms of misalignment is also discussed.

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