## Validation of multi-physics integrated procedure for the HCPB breeding blanket

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## Abstract

The wide range of requirements and constraints involved in the design of nuclear components for fusion reactors makes the development of multi-physics analysis procedures of uttermost importance. In the framework of the European DEMO project, the Karlsruhe Institute of Technology (KIT) is dedicating several efforts to the development of a multi-physics analysis tool allowing the characterization of breeding blanket design points which are consistent from the neutronic, thermal-hydraulic and thermal-mechanical point of view. In particular, a procedure developed at KIT is characterized by the implementation of analysis software only. A preliminary step for the validation of such a procedure has been accomplished using a dedicated model of the DEMO Helium Cooled Pebble Bed Blanket 4<sup>th</sup> outboard module. A global model representative of nuclear irradiation in DEMO and two local models have been set-up. Nuclear power deposition and the spatial distribution of its volumetric density have been calculated using Monte Carlo N-Particle transport code for the aforementioned models and compared in order to validate the procedure set up. The outcomes of this comparative study are herein presented and critically discussed.

Keywords: DEMO reactor, Breeding Blanket, HCPB, multi-physics, coupling, design point.