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FTP/P7-25: Neutronic Evaluation of a Power Plant Conceptual Study considering Different Modelings

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Three different models of Power Plant Conceptual Study (PPCS) are considered maintaining some conditions as the volume of the vacuum chamber (VC) based on the ITER parameters, in order to study the effect of the neutron flux related to the shape of each VC. Using MCNP, three surfaces were simulated: plane, cylindrical and torus. One of the geometries is made considering the intersection of cylinders and tori, another one with cylinders and planes and the last one just with tori. The walls along the radial axis are located at the same distance and all were filled with the same order of materials. The geometries have symmetry and then the reactor could be divided into four perpendicular parts from the top view of the reactor. In this way, it is possible to follow the flux along different trajectories. The point detector would follow the neutron flux until it gets lost. The detectors are located starting from the first wall until the last one and surrounding each wall. In addition, it is tallying the flux over each volume that surrounds the vacuum chamber. The data from these tallies would give different types of information, such as the flux through each volume and the reactions rate over the volume. Particularly, this study will identify which isotopes from the material composition might have significant values of neutrons capture, absorption, and production cross sections. Such results allow assessment of its composition along the time and the possible impact of changes in the neutronic behavior of the material.

The results give information about the behavior of each modeling, from the point of view of neutron flux shielding, neutronic activation from the materials and the possibility of a transmutation blanket.

Country or International Organization of Primary Author

BRAZIL

Primary author: Mr VELASQUEZ, Carlos Eduardo (Brazil)

Co-authors: Prof. COSTA, Antonella Lombardi (Universidade Federal de Minas Gerais (UFMG)); Prof. PEREIRA, Claubia (Universidade Federal de Minas Gerais (UFMG)); Prof. VELOSO, Maria Auxiliadora F. (Universidade Federal de Minas Gerais (UFMG))

Presenter: Mr VELASQUEZ, Carlos Eduardo (Brazil)

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