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P4.186 Evolution of tritium transfers in the lithium loop of IFMIF-DONES

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In the pathway towards the achievement of a demonstration nuclear fusion reactor DEMO, the construction of a neutron irradiation plant is a priority. Within the European framework, the construction of a facility that is capable of producing a significant amount of irradiation damage in materials as soon as possible was decided. The design for this Early Neutron Source (ENS) is DONES (DEMO-Oriented Neutron Source).

In DONES, a flow of liquid lithium is used as a target bombarded with deuterons in order to generate high energy neutrons for the irradiation of materials. The reaction between the deuterium beam and lithium produces, among other products, 3.9 grams of tritium per year.

Tritium as an unstable nucleus with beta decay must be controlled for safety. Target value of tritium concentration in the Li loop is below 1 wppm, while the target value for all H-isotopes is below 10 wppm.

A prediction of tritium inventories and leaks is fundamental to assure being below the safety limits. This is what has motivated the creation of models of these phenomena using the simulation tool EcosimPro. The program offers the possibility of mixing various disciplines (e.g., transport, control, hydraulics, etc.) by robust equation-solving algorithms. Starting from libraries previously developed, a DONES Li-Loop simulator of tritium transfers has been built.

The evolution of tritium inventories and permeation rates in the different components of the loop as well as a parametric study by H-trap efficiency are presented.

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