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The IFMIF-Dones Test Blanket Units

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Breeding blanket designs considered for DEMO include not only materials but also technologies, whose behaviour under fusion-like conditions has not yet been tested. Therefore, it is urgent to evaluate these blankets in relevant environments, with emphasis on significant radiation levels. Looking for solutions to qualify and validate the breeding blankets, IFMIF-DONES has launched a new experimental program on Test Blanket Units (TBU). The primary objective is to contribute to the BB testing in an irradiation environment similar to that expected in a fusion reactor, by performing multi-physics experiments, and highlighting the capabilities of IFMIF-DONES to qualify tritium technologies in its medium-flux area.
A preliminary exercise has already been performed with the Helium-Cooled Pebble Bed (HCPB) and the Water-Cooled Lead Lithium (WCLL) blankets, demonstrating that the effective irradiation volume in IFMIF-DONES is sufficient for relevant tritium experiments. Additionally, the TBU can help demonstrate effective temperature control of the blanket or test the bonding quality between different materials or components under a high neutron flux.
IFMIF-DONES already comprises dedicated spaces to host the auxiliary systems necessary for a proper operation of the TBU, including those for tritium handling, as well as other supplies and services (e.g. cooling loops, power supply⋯). The auxiliary systems will, in turn, monitor the purity of the tritium carrier (gas or liquid) and will be compatible with the additional needs in terms of detritiation and tritium storage that the IFMIF-DONES plant will provide. The current baseline of the main irradiation area, the Test Cell, already considers supplies and services (via the PCPs, Piping and Cabling Plugs) to the modules and TBUs that will be positioned behind the lithium target. Some of these PCPs are already planned to extend to the rear wall of the TC Liner.
In summary, together with the TBM-Program and a possible validation of blankets in a future VNS, it is expected that IFMIF-DONES can help increase the TRL of this important component.

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