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Computational challenges related to IFMIF and DONES facilities.

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Following ITER, DEMO reactor is expected to demonstrate the feasibility of safe, environmentally friendly and economically viable fusion power generation. During operation of DEMO, the materials will be exposed to a particular hostile environment as a consequence of the energetic neutrons created by fusion reactions in the plasma. The level of damage expected in fusion conditions is such that the performance of materials and components under these extreme irradiation conditions is unknown. One of the central objectives of the fusion materials program is to identify innovative materials development routes, using scientific understanding and knowledge of how materials properties evolve and change in the operating environment of a fusion power plant.
In this respect, IFMIF is considered as one of the main pillars in the international fusion program. Its double deuteron beam 125 mA each will produce enough rate of damage behind the lithium target to make available in a few years information on materials damage at DEMO relevant doses. On the other hand, DONES (DEMO Oriented Neutron Source) has been conceived as a simplified IFMIF-like plant to provide in a reduced time scale and with a reduced budget –both compared to IFMIF- the basic information on materials damage.
Although both facilities are designed to provide experimental data on how the material properties change under energetic neutron irradiation, the design of experiments to be carried out to test materials implies various computational challenges. During our talk we shall review the different computational fields associated to IFMIF and DONES facilities, such as beam dynamics, neutronic transport, calculation of collision cascades and the simulation of the microstructure evolution in the irradiated materials.

Presenter: Dr ORTIZ, Christophe (LNF - CIEMAT)

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