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Development of deuterium-deuterium compact neutron source

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In the present work, we will present the status of the deuterium-deuterium (D-D) neutron source that is being developed in collaboration between the University of Granada and the University of the Basque Country (Spain).

Our neutron source consists of an ECR ion source which accelerates a deuteron beam towards a deuterated target. The ionization to achieve the deuterium plasma is achieved by radiating the cylindrical ERC plasma chamber with a magnetron 2.45 GHz signal and an 875 G magnetic field generated by 6 NdFeB magnets located around the plasma chamber. Moreover, a cylindrical alumina RF window is used to keep the vacuum status from the ambient pressure condition inside the WR340 and helping the plasma to ignite.

Once the plasma is generated, the deuterons are extracted from the plasma chamber using a Pierce electrode geometry and three other electrostatic lenses, fixed to different negative potentials. The beam is accelerated towards copper target disk with a deuterated titanium mesh fixed to -100 kV which generates the desired neutron radiation.

There are several applications of D-D neutron sources across scientific and industrial domains. In case of University of Granada and its deep relation with IFMIF-DONES neutron source, it is worthy to mention that we plan to carry out experiments for determining the cross-sections of relevant isotopes in the studies of IFMIF-DONES to a better simulation of the behaviour of such material under high neutron flux irradiation.

Footnotes

Funding Agency

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Yes

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