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The LIPAc Beam Dump

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The International Fusion Materials Irradiation Facility (IFMIF) aims to provide an accelerator-based, D-Li neutron source to produce high energy neutrons at sufficient intensity and irradiation volume for DEMO materials qualification. LIPAc is a 125 mA 9 MeV continuous wave deuteron accelerator whose components are under construction mainly in Europe, which is being installed in Rokkasho (Japan) with the purpose of validating the IFMIF accelerator design.

The beam is stopped in the interior of a copper cone (2.5 m long, opening angle 6.8 º), cooled by water flowing at high velocity along its outer surface. This piece is surrounded by a shield made of iron and low Z materials that attenuate the neutron and gamma radiation originated by the interaction of the deuterons with the copper. It incorporates dedicated diagnostics for beam dump monitoring: accelerometers to detect localized heating due to incorrect alignment of the beam and ionization chambers to detect changes of the beam shape outside the beam dump design limits.

One of the main difficulties of this beam dump is related to the fact that the interaction of the deuterons with the copper leads to the production of long lived isotopes (mainly Zn 65). A lead shutter has been designed to be inserted in the beam tube during beam-off periods to stop the gamma radiation escaping through the beam tube and allow access inside the accelerator vault. The joint of the beam dump to the beam tube has a special design that allows its remote disconnection at the end of life of the facility. As the cartridge activation precludes any maintenance activities in the beam dump and neighbouring elements downstream the lead shutter, a careful design and material selection has been done. The manufacturing is being performed following quality standards and performing strict acceptance tests.

The cooling water system includes a coil to delay the passage of the water from the accelerator vault to the heat exchanger room where most of its components are located, letting its activity to decay. pH, oxygen content and conductivity are controlled to minimize the corrosion of the copper cone.

This paper will describe the final design of the beam dump and related elements explaining the interrelations between them and the reasons behind their main features which in many cases have changed with respect to the first conceptual designs. It updates and completes previous publications providing detailed information of the validation tests performed or to be performed to the different components and their installation procedures.

Keywords: IFMIF, LIPAc, beam dump
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Eligible for student paper award?

No

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