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A high power density beam dump for ISOL@MYRRHA

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Similar to other next generation RIB facilities, ISOL@MYRRHA is based on a high intensity proton beam in order to meet users' requirements of a significant increase of isotope yields. In the first phase of the MYRRHA project, the combination of the beam intensity (0.5 mA) and energy (100 MeV), delivered by the MYRRHA linac, together with a beam spot of a few mm in radius, results in a beam dump facing heat deposition density values significantly above to those of high energy beam facilities currently in operation.

In order to reduce heat deposition densities, conical- or wedge-shape beam dump concepts have been proposed and are mainly suited for beam spots larger than those foreseen at ISOL@MYRRHA. In addition, a beam expansion is not readily feasible for a beam dump placed after an ISOL target irradiated with a 100 MeV proton beam. Moreover, the beam dump would have to fit two dissimilar enveloping cases: i) a full focused beam, ii) a partially defocused beam due to interaction with the target.

An innovative multiple-foil concept of beam dump design is thus proposed here. A major aspect of this concept is that it relies on radiative cooling of the dump material. A tight contact between the dump material and the cooling liquid is thus avoided so that when needed the low activity cooling circuit can be easily separated from the dump material for maintenance or end-of-life disposal. The details of the material selection will be presented, through a material comparison covering aspects like radiation hazards, material activation, heat deposition, heat removal ability and the radiation-induced production of low-solubility gases like tritium. Finally, the design optimization results obtained through investigation of gradually improved concepts will be presented, along with the current design of the dump.

Primary author: Mr HOUNGBO, Donald (SCK-CEN)

Co-authors: Dr POPESCU, Lucia (SCK-CEN); Mr DIERCKX, Marc (SCK-CEN)

Presenter: Mr HOUNGBO, Donald (SCK-CEN)

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