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Online Operation of a Molten Salt Target at ISOLDE for the Beta Beams: Validation of Electro-Thermal Simulation with Experimental Data

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The main objectives of the BETA BEAMS project is to produce high energy beams of pure electron neutrinos and anti-neutrinos for oscillation experiments, by beta decay of 6He and 18Ne radioactive ion beams, studied in a decay ring at γ=100.
The production of 6He beam has already been accomplished using a thick beryllium oxide target; however, the production of the needed rate of 18Ne has proven to be more challenging. In order to achieve the requested yield for 18Ne a new high power target design based on a circulating molten salt loop has been proposed.
To verify some elements of the design, a static molten salt target prototype has been developed at ISOLDE and operated successfully.
This paper describes the electro-thermal study of the molten salt target taking into account the heat produced by Joule effect, radiative heat exchange, active water cooling due to forced convection and air passive cooling due to natural convection.
The numerical results were compared with the available experimental data in order to validate the model. This approach allows improving the reliability of the model, which will help to predict the thermo-mechanical impact of the required targets for the future facilities such as HIE-ISOLDE and the Beta-Beams.

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