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Towards 100 kW targets for electron driver beams at the TRIUMF-ARIEL Facility

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The TRIUMF ARIEL Facility will add two new target stations for Radioactive Ion Beam (RIB) production at TRIUMF, one of which will be capable of accepting a 100 kW electron “driver beam”. TRIUMF is already a world leader in the operation of “high power” (50 kW) targets for proton driver beams, however, in many aspects and particularly for the target, the exploitation of an electron driver beam presents a fresh set of challenges.

An electron-gamma ($e\text{-}\gamma$) converter is required upstream of the target, with the resulting γ -rays used to irradiate target materials. The spatial profile of the γ -rays necessitates significant changes to the dimensions and the orientation of the target with respect to the driver beam, compared to targets on the proton stations. The resulting asymmetric power deposition from irradiation and the proximity to the converter, results in new requirements for both the target heating and methods for increasing the effective emissivity to facilitate power dissipation. The ARIEL era will also introduce hermetic target vessels at TRIUMF, enabling the use of new types of target materials. In addition to the significant opportunities this may bring in the range and the yield of RIB production, there is also the potential for a significant increase in the ion/neutral load on the ion sources coupled to the targets.

The latest results from the developments to meet the heating and thermal dissipation requirements for targets for use with 100 kW electron driver beams will be presented, together with options to mitigate the effects of increased ion/neutral loads on the ion sources.

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