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Developments for Target-Ion-Sources at TRIUMF towards the ARIEL era

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Rare isotope beams are produced at the ISAC facility at TRIUMF by bombarding solid targets with 480 MeV protons at a current up to 100 μA. With target material at high temperature products will diffuse out and are guided into an ion source. Extracted ions are mass analyzed and either be send directly to experiments at an energy of several 10 keV or further accelerated to study nuclear reaction processes at high energy. Additionally, to one more target station using high energy protons, the newly to be installed ARIEL facility will use a high power (up to 100 kW) 30 MeV electron beam. The electrons will impact on a converter target to produce high energy photons via Bremsstrahlung to induce photo-fission in the isotope production target.The main challenge for the design and operation of the ion sources is the close vicinity to the target at high temperature and within high radiation fields. This requires remote handling of the assembly and minimizes any maintenance after the target ion source combination has been installed. Depending on the desired isotope different combinations of target materials and ion sources can be used. The average time of operation for one target ion source combination is about 3-4 weeks, after which the entire combination has to be disposed.
The ion sources used so far start with a simple surface ionizer for mainly alkaline elements to, a FEBIAD plasma ion source for gaseous elements with high ionization energy and several types of resonant laser ion sources for element selective ionization.
A similar set of ion sources is foreseen for the ARIEL target station. The design of the target stations has been modified as compared to ISAC to overcome problems with high voltage stability, as well as implementing improvements like simpler remote handling to increase the target station up-time.
The presentation will cover recent results from the ISAC operation and discuss the new ARIEL design features and first results on off-line prototype testing.

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