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The laser ionisation toolkit for ion beam production at thick-target ISOL facilities

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Multi-step resonance photo-ionisation is an essential component of radioactive ion beam production at most of the existing and planned thick-target ISOL facilities. At ISOLDE, the Resonance Ionisation Laser Ion Source (RILIS) is capable of ionising 40 elements. Its unmatched combination of selectivity and efficiency ensures its place as the most commonly used ion source for ISOLDE physics.

Since its initial implementation the RILIS has developed from the original copper-vapour laser pumped dye laser system into a much more versatile dual Dye and Ti:Sapphire system pumped by modern industrial solid-state lasers. Furthermore, the RILIS technique, originally exclusively applied within the hot cavity surface ion source, has been further developed to enable specific modes of operation or to exploit alternative laser atom interaction regions. The performance can now be tailored to prioritise efficiency, selectivity or versatility, depending on the requirements of the experiment. This is thanks to the multitude of laser ionisation options at our disposal: the Laser Ion Source Trap (LIST) and low work-function cavity for enhanced selectivity; and the Versatile Arc Discharge and Laser Ion Source (VADLIS), which is a multi-functional ion source for a variety of applications.

A status update on the ISOLDE-RILIS installation will be presented, including a selection of 'use case' highlights for each of the laser ion source configurations mentioned here.

Finally, an outlook towards the planned next stages of laser ion source R&D (such as the PI-LIST, ToFLIS and next-generation VADLIS), with a view to the possible interest for existing and next-generation ISOL facilities will be provided.

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