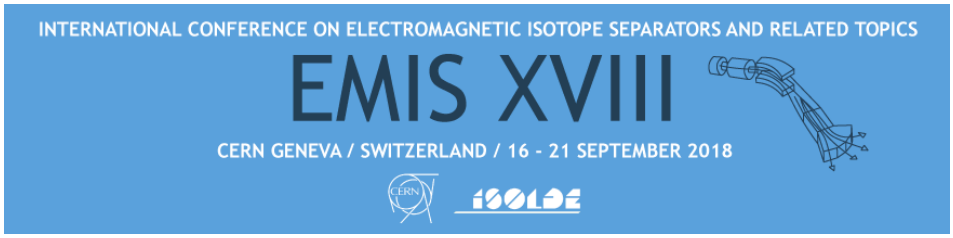

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On-line results from ISOLDE's Laser Ion Source and Trap LIST

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The method of laser resonance ionization [1] today is a well-established core technique for efficient and chemically selective radioactive ion beam production at the worldwide leading ISOL facilities such as ISAC-TRIUMF or CERN-ISOLDE. In addition, these devices allow for direct in-source laser spectroscopic investigations of exotic nuclei with lowest production yields. Nevertheless, in experiments demanding highest beam purity, suppression of beam contamination arising from competing ionization processes inside the hot cavity is essential. Correspondent techniques therefore comprise spatial separation of high temperature atomization from a clean and cold laser ionization volume inside an RFQ ion guiding structure. Namely, these are TRIUMF's IG-LIS [2] or ISOLDE's LIST, which was used for hyperfine structure spectroscopy on neutron-rich polonium previously inaccessible due to an overwhelming fraction of surface-ionized francium [3, 4].
Derived from operation experience, systematic off-line studies and simulations, a next generation of the LIST has been developed to go on-line at ISOLDE in 2018, providing highly pure 22Mg beams for measurements on its super-allowed branching ratio and half-life (IS614). The overall geometric design has been adapted to minimize deposition, while a second repelling electrode ensures additional suppression by inhibiting electron impact ionization inside the RFQ structure. Moreover, the unit undergoes additional tests to eventually further increase its performance: A DC voltage offset mode shifts the produced ions to a different mass regime, sidestepping isobaric contamination. Using high-resistance cavity materials and the LIST of matched length as field-free drift volume also enables a time-of-flight based operation mode for shortest ion bunches and subsequent purification methods by laser pulse synchronized ion beam gating [5, 6].
The presentation will show results and operation characteristics from the on-line application of the "LIST 2.0" , as well as the status of ongoing developments and future directions.

References

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