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## The laser ion source at CERN-ISOLDE: new features - more possibilities

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The Resonance Ionization Laser Ion Source (RILIS) of the CERN-ISOLDE radioactive ion beam facility is the most frequently applied ion source type. The RILIS method of step-wise resonant laser excitation and ionization of the nuclear reaction products makes it both highly selective and efficient. A continuous program of technical upgrades of the laser installation, as well as research and development of the RILIS technique is necessary to fulfil the ever-increasing demand for new, more intense, or higher purity ion beams. The 2012-2014 long shutdown (LS1) of the LHC accelerator chain suspended the operation of ISOLDE for 18 months, enabling significant RILIS upgrades and development work to be performed.

The laboratory was extended and a new, high beam quality Nd:YVO laser was added to RILIS laser system. The laser launch system for the GPS front-end with beam reference area was rebuilt and upgraded with a refined beam stabilization and monitoring system. This, in conjunction with the implementation of an autonomous machine protection system, enabled the first RILIS “on-call” operation, successfully used for four experiments during the 2014 ISOLDE on-line period. The RILIS DAQ system has been upgraded and streamlined, managing the links between RILIS, the Windmill detector system and the ISOLTRAP MRTOF-MS for in-source laser spectroscopy experiments.

In addition to these technical improvements, the RILIS capabilities have been extended to improve the efficiency, selectivity and the range of accessible elements: New ionization schemes have been investigated for holmium, mercury, lithium, barium, chromium, and germanium; laser ionization to the 2+ state has been applied for barium; and, for the first time, the RILIS has been coupled with a liquid target for the on-line production of neutron-deficient mercury beams.

In this paper we present the status of the RILIS system, a summary of the recent upgrades and new capabilities, concluding with an outlook towards the promising future areas of development.

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