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Applications of solid-state RILIS lasers in experiments at ISOLDE

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The resonance ionization laser ion source (RILIS) is the most widely used ion source at ISOLDE. Up to three beams of precisely tuned pulsed lasers ionize the element of interest with high selectivity and efficiency. To keep up with the increasing demand for RILIS use the fleet of lasers has been gradually upgraded in recent years. The system now comprises three tunable dye lasers and three complementary solid-state Titanium:Sapphire lasers (Ti:Sa), both pumped by frequency doubled Nd:YAG lasers. The operating time of the combined system reached an annual record value of >2700 hours during 2012.

The application of the RILIS for high resolution in-source laser spectroscopy and isomer separation requires a reduction of laser line-width to about 1 GHz, closely matching the Doppler-width of the atomic transitions of the heavy nuclei under investigation. This mode of operation, was a domain of the dye lasers and has now been achieved also for Ti:Sa lasers that were installed in 2011. The newly developed narrow-band Ti:Sa laser was applied for in-source laser spectroscopy of polonium, astatine and gold isotopes as well as for collinear resonance ionization spectroscopy of francium isotopes at the CRIS experiment.

The current status and on-line performance in 2012 of the RILIS laser ion source will be presented. Recent laser developments of the solid-state Ti:sapphire lasers and their application to laser spectroscopy will be described with an emphasis on the technical details. The planned improvements of RILIS infrastructure are subject to the outlook of the presentation.

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