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Laser assisted decay spectroscopy at the CRIS beam line

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The new Collinear Resonant Ionization Spectroscopy (CRIS) experiment at ISOLDE will use laser radiation to stepwise excite and ionize an atomic beam for the purpose of ultra-sensitive detection of rare isotopes, and hyperfine structure measurements. The technique also offers the ability to purify an ion beam that is heavily contaminated with radioactive isobars, including the ground state of an isotope from its isomer, which allows for sensitive secondary experiments to be performed.

A new program aiming to use the CRIS technique to select only nuclear isomeric states for decay spectroscopy has commenced this year. The isomeric ion beam is selected using a resonance of its hyperfine structure. It is then deflected to a spectroscopy station, consisting of a rotating wheel implantation system for alpha and beta decay spectroscopy, and three high purity germanium detectors around the implantation site for gamma-ray detection.

Laser spectroscopy will provide a measurement of the spin of the ground and isomeric states in the parent nucleus, while the level structure of the daughter nucleus will come from the complementary decay spectroscopy.

Here we report the current status of the Laser Assisted Decay Spectroscopy set-up for the CRIS beam line. A case study of 204Fr is presented, along with recent tests carried out on the system.

Primary authors: LYNCH, Kara (University of Manchester (GB)); RAJABALI, Mustafa (Katholieke Universiteit Leuven)

Co-authors: SMITH, Andrew (University of Manchester); CHEAL, Bradley (The University of Manchester); MARSH, Bruce (CERN); LE BLANC, Francois (Inst. Nat. Phys. Nucl. & Particules (IN2P3)-Universite de Paris-); Dr SIMPSON, Gary (LPSC); NEYENS, Gerda (Katholieke Universiteit Leuven); Prof. STROKE, Hinko Henry (New York University (US)); BILLOWES, Jonathan (University of Manchester); FLANAGAN, Kieran (University of Manchester (GB)); WENDT, Klaus (Johannes Gutenberg Universitat, Mainz); DEWOLF, Koen (Katholieke Universiteit Leuven); BISSELL, Mark (Katholieke Universiteit Leuven (BE)); HORI, Masaki (Max-Planck Institute of Quantum Optics (DE)); VINGERHOETS, Pieter (Katholieke Universiteit Leuven); ROTHE, Sebastian (Johannes-Gutenberg-Universitaet Mainz (DE)); DE SCHEPPER, Stijn (Katholieke Universiteit Leuven); KOBAYASHI, Takumi (The University of Tokyo); COCOLIOS, Thomas Elias (CERN); PROCTER, Thomas (University of Manchester)

Presenter: LYNCH, Kara (University of Manchester (GB))

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