LASer techniques for Exotic nuclei Research (LASER)

Aim

Develop tools and perform R&D for the Resonance Laser Ion Source (RILIS):
- Production of extremely pure ground-state and isomeric beams of exotic nuclei
- Accumulation, cooling, bunching and polarization of clean radioactive ion beams

Resonant Laser Ionization

Energy (eV)

- Increase of ionization efficiency
  - More efficient use of ISOL beams
  - New exotic (polarized) RIB
  - Optimization of RIB time structure
  - Easy injection into ion traps
  - Determination of radii, spins and moments using in-source spectroscopy
  - Reduction of background in collinear spectroscopy

- Increase of ion beam quality
  - Purity
  - Emittance
  - Time structure
Laser ion sources for radioactive beams

Complementary! | Hot cavity | Gas cell
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Thick target | + | -
Refractory elements | - | +
Delay time | +/- | +
Partners:

- GSI - Darmstadt (Germany)
- University of Mainz (Germany)
- University of Jyvaskyla (Finland)
- University of Manchester (U.K.)
- ISOLDE-CERN (Switzerland)
- IPN - Orsay (France)
- University of Leuven (Belgium)

Associated partners:

- TRIUMF (Canada)
- Oak Ridge (U.S.A.)
- Gatchina (Russia)

Who benefits within EU?

Research Infrastructures:
- ISOLDE-Geneva: RILIS/hot cavity and in-source spec./polarization, isomeric beams
- LISOL-Louvain-la-Neuve/Leuven: RILIS/gas cell
- JYFL-Jyvaskyla: RILIS/gas cell and in-source spectroscopy/polarization
- GSI-Darmstadt: SHIPTRAP and FRS-gas cell (fall back position), laser spectroscopy
- GANIL/SPIRAL: developments at IPN-Orsay for SPIRAL II

Other research institutes:
- IPN-Orsay: ALTO
- ....

second generation facility EURISOL

- selectivity, efficiency, time structure
- isomeric beams
- management of the radioactive inventory
Research Program

Description of work:

Task T-J08-1: Development of a new laser system for RILIS (K. Wendt)
   Subtask T-J08-1.1: Construction of a prototype solid-state laser system
   Subtask T-J08-1.2: Implementation, testing and comparing at ISOL systems

Task T-J08-2: New laser ionisation schemes and new beams (I. Moore)
   Subtask T-J08-2.1: New laser ionisation schemes
   Subtask T-J08-2.2: Experiments with the new beams

Task T-J08-3: Prototype LIST system (W. Nörtershäuser)
   Subtask T-J08-3.1: Design, development and construction of off line LIST
   Subtask T-J08-3.2: Advice for the design of on-line LIST

Task T-J08-4: Improve selectivity of RILIS: reduction of surface ionisation (V. Fedosseev)

Task T-J08-5: Implementation of electrical fields in the gas cell concept (S. Franchoo)

Task T-J08-6: Feasibility study to polarize exotic nuclei with lasers (P. Campbell)
Saariselka, Finland, April 2007
Joint TRAPSPEC – LASER workshop