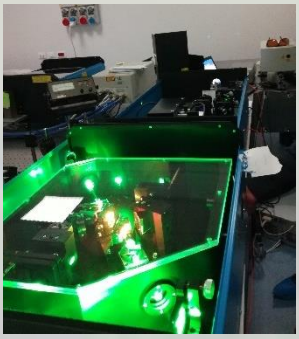
Laser Resonant Ionization at Selective Production of Exotic Species (SPES) Project in Laboratori Nazionali di Legnaro



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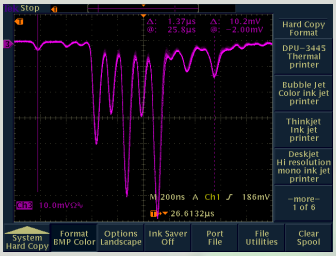
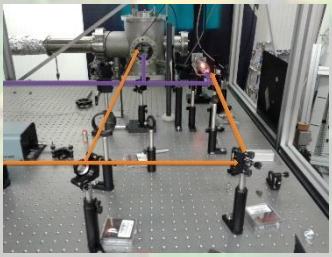
The SPES (Selective Production of Exotic Species) project is under construction at Laboratori Nazionali di Legnaro. The aim of the project is to generate pure Radioactive Ion Beams (RIBs) from fission fragment of a high power Uranium Carbide target. RIBs are interesting for both nuclear research and, for example, pharmaceutical applications. In terms of element purity, the best ionization technique is resonant laser ionization.



Atoms of a selected element/isotope are ionized via stepwise resonant excitations using two or three laser beams tuned to the frequencies of the most efficient quantum jumps. As the energy level structure is a fingerprint of a specific atom, the resonant photo-ionization process can provide a direct selectivity close to 100%. Tunable and powerful lasers are needed to apply this technique in a RIB facility. The SPES project has just finished the installation of a newly designed all solid state laser system to fulfill this paramount task. Three tunable TiSa lasers, independently pumped by three Nd:YLF lasers, emit light beams whose wavelengths can be chosen in a very wide range (350 – 900 nm), by also making use of second and triple harmonics generation setups.



Furthermore, several parameters as power, wavelength and position of the laser beams, are continuously monitored and stabilized by automated systems, in order to achieve high RIB stability.

The seminar will introduce to the laser resonant ionization technique and will show the experimental results obtained in a off line lab as a general proof of our ability of controlling and manipulating the processes on several species, as aluminum, germanium, tin.