

Laser Spectroscopy at ISOL Facilities

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Optical hyperfine structures and isotope shifts of radioactive atoms or ions can be measured at ISOL facilities with high precision and sensitivity using a variety of laser spectroscopic techniques. The analysis of these structures and shifts provides measurements of some of the fundamental properties of the nuclear ground state or isomeric states, namely the magnetic dipole and electric quadrupole moments, the nuclear spin, and the difference in the nuclear mean square charge radius between isotopes. This last quantity is of particular interest since it contains information on the nuclear volume, shape and diffuseness of the nuclear surface.

The status of experimental programmes and techniques currently used at ISOL facilities will be briefly reviewed. This will include collinear-beams, in-source and atom-trap laser spectroscopic techniques. The talk will concentrate on the new opportunities provided by ion beam cooler-bunchers for spectroscopy of exotic nuclei. This includes the possibility of preparing the ion beams in selected metastable ionic states by in-cooler optical pumping, and the application of resonance ionization spectroscopy in the collinear beams geometry using bunched ion beams. This technique has the potential to be as sensitive as in-source resonance ionization spectroscopy but with the advantage of having the high resolution necessary for measurements on light and medium-mass nuclei.