THE SPECTROSCOPY OF URANIUM ATOM WITHIN THE "SILVA" PROGRAM

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Atomic vapor laser isotope separation (SILVA) has been recognized as being an attractive powerful technique for the enrichment of uranium for light water reactor fuel. Since the heart of the AVLIS process is based on selective multistep photoionization of an uranium atomic vapor stream, the development of this process in France, has stimulated intensive studies in the field of uranium spectroscopy.

The multistep photoionization of uranium atoms implies to choose, preliminarily, an irradiation scheme and this choice is only possible if a certain number of spectroscopic parameters are known (oscillator strengths, isotopic shifts, hyperfine structures, lifetimes ...). Several spectroscopic techniques have been investigated to measure these parameters; for each parameter the most appropriate technique has been chosen.

Some of these parameters (e.g. transition oscillator strengths) must be very accurately measured, since the resulting excitation cross sections determine the laser fluences needed for effective atomic photoionization; in this case different methods are needed.

We review in this article several different spectroscopic techniques used at Saclay and give, as an example, typical results obtained for a photoionization sequence (0 - 16900 - 34659).