

Towards online coupling of TRIGA-SPEC to the research reactor TRIGA Mainz

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At the TRIGA research reactor in Mainz the TRIGA-SPEC setup is under construction [1]. The aim is to perform Penning trap mass spectrometry and collinear laser spectroscopy on short-lived neutron-rich nuclides in order to determine nuclear ground-state properties like masses and charge-radii. The nuclides are produced by neutron-induced fission of an actinide target located in a target chamber close to the reactor core. A key issue is the extraction of these nuclides from the target chamber through the 3 m thick concrete biological shield of the reactor, and ultimately the preparation of a mass-selected, cooled and bunched low energy ion sample for high precision experiments on nuclides with minimal half-lives in the order of 1 s. A relatively simple and rather inexpensive way to extract the fission products is a gas jet loaded with aerosols, where transport efficiencies up to 70 % and a transport time of 400 ms were achieved at TRIGA-SPEC using helium gas and carbon aerosols [2]. The carrier gas can be removed with the help of a skimmer and the remaining serious challenge is to separate the fission products from the aerosols and ionize them. For this purpose we are developing an ECR-type ion source on a high voltage platform [3]. Due to the small plasma volume and relatively low plasma density ($\sim 10^{11} \text{ cm}^{-3}$) very low ionization efficiencies are expected. The current status of TRIGA-SPEC will be given, some new achievements and ideas will be presented, and the issue of the online-coupling will be discussed.

[1] J. Ketelaer et al., Nucl. Instr. Meth. A 594, 162 (2008)

[2] M. Eibach et al., Nucl. Instrum. Methods A 613, 226-231 (2010)

[3] Ch. Smorra et al., J. Phys. B: At. Mol. Opt. Phys. 42, 154028 (2009)