Study of $^{236}$U/$^{238}$U ratio at CIRCE using a 16-strip silicon detector with a TOF system

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Accelerator Mass Spectrometry (AMS) is presently the most sensitive technique for the measurement of long-lived actinides, e.g. $^{236}$U and $^{239}$Pu. A new actinide line [1,2,3,4], based on a 3-MV AMS pelletron tandem system, is operated at the Center for Isotopic Research on Cultural and Environmental heritage (CIRCE) [5] in Caserta, Italy.

In order to validate the energy and position determinations of the $^{236}$U ions, the energy calibration of the 16 strip silicon detector was verified by comparing the pulse height defect with the literature values.

Results on $^{236}$U/$^{238}$U isotopic ratio show that the background level of about $3 \times 10^{-11}$ (5x10$^{-12}$ was obtained just with the central strip) can be reached using a Time of Flight-Energy (TOF-E) system in conjunction with the 16-strip silicon detector with a flight path of 1.5 m. This value is just slightly better than the upper limit of $6 \times 10^{-11}$ estimated from the yield distribution vs strip number measured without the TOF-E system [2]. We interpret this result as a consequence of the angular straggling due to the thickness of the carbon foil, which deteriorates the spatial separation of the interfering ions with respect to $^{236}$U.

In this picture to identify more precisely the background contributions and their spatial distributions an upgrade of the CIRCE actinides detector system is planned for the future using a TOF-E system, with a longer flight path, a thinner carbon foil and a 16 strip silicon detector.