THE OPTIMIZATION OF A 4-ELEMENT INPUT LENS ON A HEMISPHERICAL DEFLECTOR ANALYZER USING SIMION

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We report on our simulation procedure for finding the optimal voltages of an input lens used for high resolution Auger projectile electron spectroscopy at the new atomic physics experimental station located at the 5MV Tandem Accelerator of the INP at Demokritos [1]. The station consists a hemispherical deflector analyzer (HDA) with a 4-element injection lens and 2-D position sensitive detector (PSD) to be used for studies of projectile excitation processes in energetic ion-atom collisions.

The optimization was carried out by simulations using the SIMION 8.1 package [2]. SIMION solved the Laplace equation in the lens and HDA for the given geometry of the experimental setup utilizing the finite difference method. Simple initial electron distributions were flown through the lens entry aperture, through the HDA and on to the PSD. The two lens voltages were treated as independent search parameters while the beam trace width along the dispersion direction at the PSD was recorded for each fly. The simulations were carried out for various lens pre-retardation factors F. The spectrometer with an example of our results for F=2 is shown in Fig. 1. These results will also soon be tested in the laboratory on the experimental apparatus.

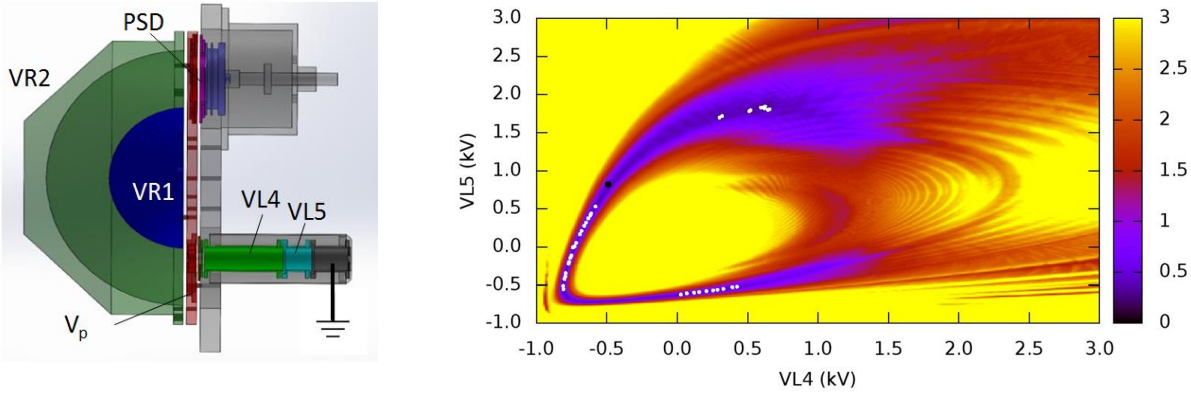

Figure 1. (Left) HDA with lens and PSD. (Right) Contours of minimum trace widths for lens voltage VL5 and VL4 and pre-retardation factor F=2. White dots indicate some of the best voltage combinations leading to optimal energy resolution. Black dot experimentally determined point.

References:

[1] http://apapes.physics.uoc.gr
[2] http://simion.com