Voltage optimization of a 4-element injection lens on a hemispherical spectrograph with virtual entry aperture

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Results from the simulation of a biased paracentric hemispherical deflector analyzer (HDA) with input lens and position sensitive detector (PSD) used in our APAPES collaboration [1] are presented. Calculations of electron trajectories in the HDA fringing fields and the lens potentials were performed and cross checked using both boundary-element (BEM) and finite-difference (FDM) methods. The two middle lens electrode voltages were varied as free parameters, while various criteria were used to select the optimal voltages [2] such as minimization of the beam spot at the 2-D PSD, minimization of the lens magnification and beam angle at the lens image plane etc. in an effort to obtain improved energy resolution. The lens voltages obtained in this way from simulations were then tested on the new electron spectrograph at the Demokritos 5 MV Tandem Accelerator Laboratory, in many cases showing improved resolution over the previously used empirically found lens voltages.

References

[1] http://apapes.physics.uoc.gr/
[2] T. J. M. Zouros and E. P. Benis, Applied Physics Letters **86**, 094105 (2005).

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