OPTIMAL INJECTION LENS PARAMETERS FOR IMPROVED ENERGY RESOLUTION OF A HEMISPHERICAL SPECTROGRAPH

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Instrument optimization and calibration are the most significant practical issues in any charged particle spectrograph. In electron spectrometers, an understanding of the injection lens parameters and their effects on the energy spectrum is required for optimization. In this study, the effects of lens parameters were analyzed using a biased paracentric hemispherical spectrograph with a 4-element injection lens in an effort to understand their effect on the energy resolution. The two adjustable lens electrode voltages were varied as free parameters, while beam spots of minimum size on the 2-D position sensitive detector were searched for using a beam shaping technique in an effort to obtain improved energy resolution. The resulting lens voltages were then also tested experimentally on the analyzer at the Demokritos 5 MV Tandem Accelerator Laboratory. Good overall agreement was found between simulation and measurements, particularly at the best resolution working points.