

## Abstract

The 2 MV 6SDH-2 tandem pelletron accelerator installed at CASP, GC University Lahore has developed over the past years from acceptance tests to an extremely reliable and appropriate research tool in the field of particle accelerator physics, having capability of providing variety of ion beams from 300 keV to 20 MeV in energy. Many electrostatic and magnetic devices are employed to steer an ion beam in an accelerator system all the way from ion source to experimental setup. Mathematical modeling and optimization of low energy beamline has been done for this accelerator. Several ion optics and steering devices are provided in the pre-acceleration beamline for ion beam manipulation and in order to optimize the overall beam transmission. As the quality of the beam from the accelerator depends upon the design of these electrostatic and magnetic devices, optimum settings are derived by manually adjusting voltages and currents provided to low energy beamline components. From these calibrations and optimization measurements, calculations have been made for mass analysis magnets, steering and focusing components and the results have been represented. The findings show that the relationship between voltages and currents of accelerator components are complex and often nonlinear, the system involve large number of interrelated parameters to control in order to tune the desired output current and beam profile at the end-stations. The details of the experiments and the data analysis are presented in this thesis.