

Electrostatic 6D phase space detector for KeV ions

Ziga Brencic^{1, 2}, Mitja Kelemen¹, Matevz Skobe^{1, 3}

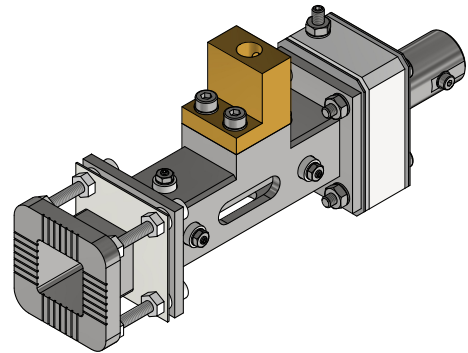
¹ Jožef Stefan Institute, Ljubljana, Slovenia

² Faculty of Mathematics and Physics, University of Ljubljana, Ljubljana, Slovenia

³ Jožef Stefan International Postgraduate School, Ljubljana, Slovenia

Abstract:

One of the key issues in the field of ion optics is knowing what are the properties of our ion beam. What is the beam energy distribution (E), beam momentum distribution (p_x , p_y) and how the beam is distributed in the (x , y) plane perpendicular to the beam flight direction (z). In other words we want to know what is the full 6D phase space of the ion beam.



CAD model of the 6D phase space detector.

Typically ion beams are probed using the Faraday Cup (FC). By measuring the ion current at different positions one gets the distribution of the beam with respect to (x , y , z), a 3D phase space map.

To obtain the momentum distribution (p_x , p_y) an electrostatic steerer is added in front of the FC, the combined detector is called Allison emittance scanner (AES) [1]. This gets us to the 5D phase space measurement.

In this talk we will present an instrument that can determine the 6 dimensional phase space of the low energy beams (up to 50 keV). This is achieved by adding an additional wire grid on bias potential (V_B) in front of the AES. By applying V_B potential to the grid we filter out the ions with kinetic energy lower then: $Q V_B$ and by varying V_B we can obtain the final sixth component of the phase space, beam energy distribution (E). Thus measuring all six degrees of freedom of the ion beam: (x , y , z , p_x , p_y , E).

We will present how we have built, tested and used the fully electrostatic 6D phase space scanner, to obtain all properties of the ion beam.

[1] P. W. Allison, et. al, IEEE Trans. Nucl. Sci., vol. 30, no. 4, pp. 2204–2206, Aug. 1983.

Keywords:

Category (topic):

Preference:

Corresponding author:

E-mail: ziga.brencic@ijs.si

Fundamentals

Oral

Ziga Brencic