

Beam defocussing and profile measurement at the University of Alberta van de Graaff Accelerator

St. McQuarrie

Faculty of Pharmacy and Pharmaceuticals Sciences
University of Alberta
Edmonton, Alberta, T8E 1C1, Canada

The 7 MeV van de Graaff accelerator in the Nuclear Research Center at the University of Alberta has been used since 1972 for the production of short-lived positron emitting radionuclides. These production runs were interspaced between nuclear physics experiments and usually required accelerator adjustments to higher energies and beam currents. For radionuclide production the maximum possible energy from this machine was desirable. This made the accelerator somewhat unstable and increased the probability of the high-voltage accelerating potential sparking to ground-voltage. From a radionuclide production point-of-view, this caused the beam to go through several sharp focusses on the entrance window of the target as the van de Graaff regained its operating potential. This 'sparking' phenomena had an obvious deleterious effect on production and consequently beam currents were restricted to a few microamperes.

In 1983 modifications were made to the isotope production line to facilitate on-target beam currents of 20–30 μA . To lessen the effect of 'sparking' a quadropole lens was added to the system approximately 6 m from the target for the purpose of defocussing the beam across the 1 cm diameter foil. A beam profile monitor that used a spinning tantalum wire in the path of the beam was used to measure the beam focussing effect and was successfully tested at these currents. Figure 1 shows the components of the radionuclide production line.

These modifications permitted a higher beam current to be put on the target, however, 'sparking' still caused occasional catastrophic window failures. A beam wobbling device was contemplated but as the lifetime of the accelerator was drawing to a close, the radionuclide production facility was also closed down (1985).

Figure 1
Schematic Diagram of Radionuclide Production Line

Van de Graaff Accelerator →

