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Analysis of Dees Radius Changes to the Energy Produced by Cyclotron as a Proton Accelerator Using Python Programming

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Introduction: Proton radiotherapy is a cancer treatment that minimizes damage to healthy tissue. Currently, cyclotrons are the most commonly used proton accelerators. Designing a cyclotron requires determining parameters such as dees radius, magnetic field strength, and electric potential to achieve the desired energy. This study examines the relationship between dees radius and the energy produced by a cyclotron proton accelerator using Python programming. **Methods:** This study employed an in silico approach with Python in Jupyter Notebook Integrated Development Environment. Control variables included proton charge, mass, voltage, magnetic field strength, and dees plate distance. The independent variable was dees radius; the dependent variable was kinetic energy. **Results:** Proton motion generated energies of 0.4426 MeV, 1.644 MeV, 3.941 MeV, 7.246 MeV, and 11.10 MeV for dees radii of 0.1–0.5 m. An increase in the dees radius leads to more proton rotations, causing more frequent gap crossings, which in turn raises the proton speed and kinetic energy. **Conclusions:** The size of the cyclotron dees radius can be adjusted according to the energy requirements needed to kill cancer cells

Keywords: python, proton radiotherapy, cyclotron