

INTISARI

Studi Sistem Ekstraksi Berkas Proton pada Siklotron 13 MeV

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Telah dilakukan studi sistem ekstraksi berkas proton pada siklotron DECY-13. Pada pengembangan siklotron, studi sistem ekstraksi sangat penting untuk mengetahui informasi letak *stripper foil* yang tepat dan karakteristik berkas agar produksi radioisotop oleh siklotron dapat optimal. Penelitian ini bertujuan untuk menentukan posisi *stripper foil* serta karakteristik berkas. Studi dilakukan dengan mensimulasikan lintasan berkas dan dinamika berkas. Karakteristik berkas yang diperoleh berupa kestabilan berkas, kenaikan energi tiap putaran, pergerakan vertikal serta jarak antar putaran. Simulasi dilakukan menggunakan program simulasi CYCLONE. Hasil menunjukkan bahwa *stripper foil* dapat diletakkan di $r \approx 41,5$ cm, dengan lebar fase awal sebesar 120° . Jumlah putaran minimum sebanyak 83 putaran, serta kenaikan energi tiap putaran sebesar 73-157 keV. Berkas mengalami resonansi radial ($\nu_r = 1$) pada awal percepatan, yang menyebabkan terjadinya pergeseran fase sebesar $\pm 2^\circ$. Pergerakan vertikal maksimum berkas masih dalam jangkauan celah dee (± 1 cm) yakni sebesar $\pm 0,5$ cm dari bidang median.

Kata Kunci: Siklotron, Sistem ekstraksi, *Stripper foil*, CYCLONE

ABSTRACT

Study on Proton Beam Extraction System of 13 MeV Cyclotron

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A study of the proton beam extraction system on the DECY-13 cyclotron has been carried out. In the development of the cyclotron, the study of the extraction system is very important to find out the exact location of the foil stripper and the characteristics of the beam so that the production of radioisotopes by cyclotrons can be optimal. This study aims to determine the position of the foil stripper and the characteristics of the beam. The study was carried out by simulating the trajectory of beam and the beam dynamics. The beam's characteristics include beam stability, energy gain per turn, vertical movement, and turn separation. Simulations were carried out using the CYCLONE simulation program. The results show that the *stripper foil* can be placed at radius $r \approx 41.5$ cm with phase width of 120° . Minimum turn number to achieve 13 MeV is 83 turn, and energy gain per turn is 73-157 keV. The beam experiences radial resonance ($\nu_r = 1$) at the beginning of the acceleration, which causes a phase shift of about $\pm 2^\circ$. The maximum vertical movement of the beam is still within the range of the dee gap (± 1 cm) which is about ± 0.5 cm from the median plane.

Keyword: Cyclotron, Extraction system, Stripper foil, CYCLONE