

Modification of a conventional 37 in cyclotron

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The conversion of our 37-inch cyclotron has been essentially completed and beam development is well under way. The design includes four-fold AVF symmetry with straight sectors, two 45° in-the-valley dees, central region programming, external-gap shimming and a simple mechanical arrangement for frequency changes. The machine is field limited and the best beam achieved so far consists of $100 \mu\text{A}$ of protons. The beam energy has been measured externally by a rough method to be 17.8 MeV with an energy spread of 80 keV. Electrostatic 90° deflection is employed with a magnetic channel to provide some radial focusing and steering. Extraction efficiencies of up to 40% have been measured. A principal feature of this modification is that it was done at extremely low cost. As many components as possible from the old machine were used, including the main magnet and supply, the oscillator power supply, the vacuum system, the ion source and the control and indicator system. The magnetic field program involved only the isochronisation of the azimuthally averaged radial field dependence. No trim coils are used, and the external isochronising shims are easily replaceable for large energy changes. No attempt has yet been made to test the limits of beam energy variation.