

CYCLOTRON CV-28

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The cyclotron model CV-28, manufactured by The Cyclotron Corporation USA, is a compact, isochronous, multi-particle radiation source where protons, deuterons, $^3\text{He}^{++}$ and alpha particles can be accelerated with variable energy up to 24, 14, 36 and 28 MeV respectively. It is a versatile machine and can be used in research and development in many fields such as radioisotope production, excitation functions studies, nuclear reactions, materials science and others. The CV-28 model has a penning type ion source and it is a positive ion machine. During the acceleration the beam can be intercepted, at any radius, by one beam probe, located inside the cyclotron chamber. In the extraction, the beam is deflected by an electrostatic channel (deflector) positioned between the Dees, passing afterwards through a focusing magnetic channel, before leaving the cyclotron at the exit port. Two sets of three harmonic coils are located radial inside the acceleration region to provide for the centering of the beam in the cyclotron. The beam transport system consists of a main external beam line with steering and 4 poles lens. A switching magnet deflects the beam to each external beam line where the targets are installed. The vacuum chamber has a diameter of 965 mm and a maximum extracting radius of 420 mm. The weight of the cyclotron is 22.0 tons and the average magnetic field is 1.74 T (17.4 K Gauss). The RF system operates with a fixed frequency in the range of 6.0 to 25.5 MHz, depending on the energy and the accelerated particle. Although it has seven external beam line available, only three are available and are located inside the cyclotron vault. The nominal characteristics are shown in (TAB.1).



FIGURE 1 - Control room of the cyclotron CV-28.

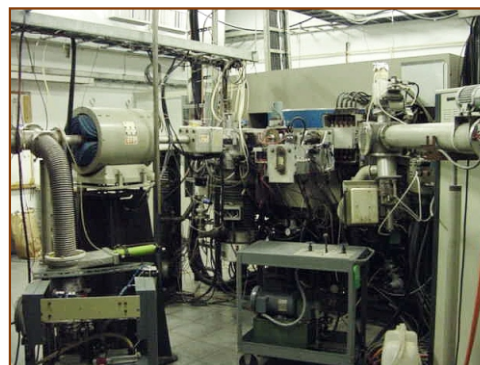


FIGURE 2 - Cyclotron CV-28.

TABLE 1 - Nominal characteristics of the cyclotron CV-28.

Particle	Energy (MeV)	I_{EXT} (μA)	I_{INT} (μA)
H^+	2-24	40-60	200
$^2\text{H}^+$	4-14	50-100	300
$^3\text{H}^{++}$	6-36	5-50	135
He^{++}	8-28	6-40	90

Tolerance: ± 0.5 MeV (E_{min}); ± 1 MeV (E_{max})
Resolution? 0.5% or 50 KeV (consider the max.)

Up to 2000, this cyclotron was used for two main objectives:
a) to produce routinely radioisotope such as ^{67}Ga , ^{123}I and ^{18}F and
b) to make irradiation for several researches such as radiation damage, target development, excitation functions and nuclear reactions studies, embrittlement due to Helium, activation analysis (wear measurement), optimization of chemical processes for radioisotope production, beam homogeneity and tracks creation in CR-39 polymer.

Now this cyclotron is out of operation. In the next future efforts will be dedicated in order to make the decommissioning and make all necessary changes in the build to install a new small cyclotron with targets dedicated to PET radioisotope production, mainly ^{18}F and ^{11}C .