

**ENTRY NO:** C17  
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**Machine Name:** VARIABLE ENERGY CYCLOTRON  
**Institution:** VARIABLE ENERGY CYCLOTRON CENTRE,  
DEPARTMENT OF ATOMIC ENERGY.  
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#### History

**Designed by:** inhouse  
**Construction Dates:** 1969-77  
**First Beam Date:** June 1977 (Internal), July 1978 (External)

#### Characteristic Beams

Proton	30 MeV	9E13
Deuteron	30 MeV	1.2E14
Alpha	80 MeV	3E13
Oxygen	180 MeV	3.6E11
Neon	240 MeV	3E11
Nitrogen	122 MeV	1.7E11
Sulphur	230 MeV	4E10
Argon	350 MeV	5E10

#### Transmission Efficiency (source to extracted beam)

**Typical (%)**: 1 for external ECR Source  
**Best (%)**:

#### Emittance

**Emittance Definition:**  
**Vertical (pi mm mrad)**: 17 (90%)  
**Horizontal (pi mm mrad)**: 22 (90%)  
**Longitudinal (dE/E[%] x RF[deg.])**:

#### USES

**Basic Research (%)**: 35  
**Development (%)**: 15  
**Therapy (%)**:  
**Isotope Production (%)**:  
**Other Application (%)**: 20  
**Maintenance (%)**: 20  
**Beam Tuning (%)**: 10  
**Total Time (h/year)**: 6000(Average)

#### TECHNICAL DATA

##### (a)Magnet

**Type:** compact  
**Kb (MeV)**: 130  
**Kf (MeV)**: 70  
**Average Field (min./max. T)**: 1.7  
**Number of Sectors**: 3  
**Hill Angular Width (deg.)**:  
**Spiral (deg.)**: 55 max  
**Pole Diameter (m)**: 2.24  
**Injection Radius (m)**:  
**Extraction Radius (m)**: 0.99  
**Hill Gap (m)**: 0.19  
**Valley Gap (m)**: 0.30

##### Trim Coils

**Number**: 17x2  
**Maximum Current (A-turns)**: 2500

##### Harmonic Coils

**Number**: 5xNsectorsx2  
**Maximum Current (A-turns)**: 300

##### Main Coils

**Number**: 1x2  
**Total Ampere Turns**: 560000  
**Maximum Current (A)**: 2800

##### Stored Energy (MJ):

**Total Iron Weight (tons)**: 275

**Total Coil Weight (tons)**:

##### Power

**Main Coils (total KW)**: 392

**Trim Coils (total, maximum, KW)**: 250  
**Refrigerator (cryogenic, KW)**:

##### (b)RF

##### Acceleration

**Frequency Range (MHz)**: 5.5-15.5  
**Harmonic Modes**: 1,3  
**Number of Dees**: 1 with Dummy Dee  
**Number of Cavities**: 1  
**Dee Angular Width (deg.)**:180

##### Voltage

**At Injection (peak to ground, KV)**:  
**At Extraction (peak to ground, KV)**:  
**Peak (peak to ground, KV)**: 60  
**Line Power (max, KW)**: 300  
**Phase Stability (deg.)**:  
**Voltage Stability (%)**: 0.2

##### (c)Injection

**Ion Source**: PIG, ECRIS  
**Source Bias Voltage (kV)**: 8-10  
**External Injection**: axial  
**Buncher Type**: First harmonic.Double Drift  
**Injection Energy (MeV/n)**: **0.003-0.004 (typical)**  
**Component**: 90degree Analysing magnet, Quaqrupoles, 2x45 degree bending Magnet, glasser lenses, Dipoles  
source bias voltage: 8-10kV  
**Injection Efficiency (%)**: 15  
**Injector**: Mirror Inflector

##### (d)Extraction

**Elements, Characteristic**: 2 Electrostatic deflectors, Tungsten Septum  
**Typical Efficiency (%)**: 20  
**Best Efficiency (%)**: 25

##### (e)Vacuum

**Pumps**: Oil Diffusion, Cryopanel, Cryopump on Dee tank  
**Achieved Vacuum (Pa)**: 1.006E-4

**REFERENCES** Int. Cyclotron Conf. Proc. 2001, 1998, 95, 92, 89, 86, 84, 78, 75, 72

#### EXPERIMENTAL FACILITIES

915mm Scattering chamber, Target and Detector Lab., Electronic module, Radiochemistry, Radio-Isotope Lab., ISOL System, Rabbit, Online Data analysing computer. RIB facility, National Gamma Array Facility

#### COMMENTS

Cyclotron is presently delivering Heavy Ion beams to experimentalists. A number of sub-systems are being upgraded.