

Entry: **C32**
 Machine Name: Variable Energy Cyclotron
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HISTORY LBL
 Design by:
 Construction time: 1969-77
 First beam: June 1977 (Internal)
 July 1978 (External)

CHARACTERISTIC BEAMS
 ions / energy (MeV/n) / current (pps) / power (W) :
 - p, d, α / 20, 20, 20/5 x 10¹³
 - $0^{5+}/12/2$ x 10¹¹ (Internal)
 transmission efficiency (total)
 - typical: % - best: %
 transverse emittance (rms)
 - vertical: 12 π mmrad
 - horizontal: 18 π mmrad
 longitudinal emittance (rms) $\Delta E/E$.deg RF

USES
 basic research: 40 % therapy: %
 development: 5 % isotope production: %
 other applications: 35 % maintenance: 20 %
 beam tuning: %
 total time: h/year

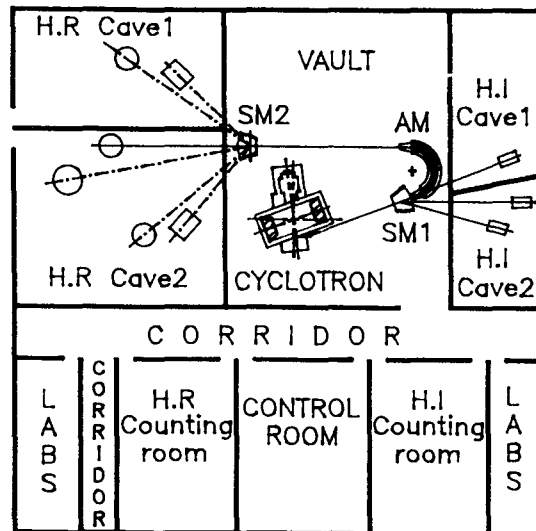
TECHNICAL DATA
 a) magnet
 type: Room Temperature
 Kb: 130 MeV/A Kf: - MeV/A
 average field (min-max): 1.7 (max) T
 number of magnet sectors: 3
 - angle: deg
 - spiral (max): 55 deg
 pole parameters
 - diameter: 2.24 m
 - injection radius: m
 - extraction radius: 0.99 m
 hill gap: 0.19 m valley gap: 0.3 m
 field trimming
 - trim coils
 - number: 17
 - current (max): 2500 A
 - harmonic coils
 - number: 5 per valley
 - current (max): 300 A
 - others
 - number:
 - current (max): A
 main coils:
 - number: 1
 - Ampere-turns: 5.6 x 10⁵ A.T.
 - current: 2800 (max) A
 stored energy: MI
 weight : - iron: 253 t - coils: 9 t
 power
 - main coils (total): 490 kW
 - trim coils (total max): 435 kW
 - refrigerator (cryogenic): kW

b) RF
 - acceleration
 - frequency range: 5.5 - 16.5 MHz
 - harmonic modes: 1, 3
 - number of dees: 1
 - angular aperture: 180 deg
 - voltage:- average (min-max): 70 (max) kV
 - variation with radius:
 - power in (max): 300 kW
 - stability: - phase: deg - voltage: 0.2 %

- other cavities
 - purpose:
 - frequency range: MHz
 - region of influence: m
 - voltage (max): kV
 - power in (max): kW
 - stability:- phase: deg - voltage: %
 c) injection Ehler's (PIG type)
 - internal source:
 - external (radial/axial): Axial
 - elements: Magnetic quadrupoles, Glazer lenses, Magnetic dipoles
 - source voltage: 8 - 10 kV
 - injection energy: 0.03 - 0.04 (typical) MeV/n
 - buncher: Sinusoidal
 - injection efficiency: %
 d) ion sources/injector ECR
 e) extraction
 - elements, characteristics:
 - Electrostatic (two electrodes; entry and exit) Tungsten septum
 - efficiency 15 % - best: 25 %
 f) vacuum 2, 89 cm oil diffusion pumps, 25 cm
 - pumps: diffstak near extraction, Cryopump on dee tank
 - achieved vacuum: 2.7 x 10⁻⁴ Pa

REFERENCES
 a) About VEC CYCLOTRONS '86', '84', '81', '78', '75', '72'
 b) About ECR: CYCLOTRONS '95', '89', '84'

EXPERIMENTAL FACILITIES
 915 mm Scattering Chamber, Target, Detector Lab.,
 Electronic module, Radiochemistry, radio-isotope Lab.,
 ISOL System, Rabbit, on-line data analysing computer.
PLAN VIEW OF FACILITY



COMMENTS

