

ENTRY NO. C61 Date October 5, 1995
 Name of Machine 88-Inch Cyclotron
 Institution Lawrence Berkeley National Laboratory
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 In Charge: C.M. Lyneis Reported by: C.M. Lyneis

HISTORY
MILESTONE DATES:
 Design 1958 Model Tests 1958-1959
 Construction 1959-62 First Beam external 1962
DESIGN/CONSTRUCTION BY:
 in house Yes other outside contracts
COST: Accelerator 3.5 M\$ Facility 5.1 M\$
FUNDED BY: U.S. D.O.E.

STATUS
STAFF: Machine
 Scientists 3 Engineers 3.5
 Technicians 17 Students
 Research (in house/external)
 Scientists 28 / 108 Engineers 0 / 30
 Technicians 0 / 22 Students 10 / 74
BUDGET: Machine 3.4 M\$ Funded by DOE
 Research Funded by

TIME DISTRIBUTION:
 Basic Research (in house/external) 37.5% / 39.7%
 Applied Program (in house/external) 3.4% / 9.2%
 Maintenance 6.4% Development 3.8%

MAGNET
POLE PARAMETERS:
 Diameter 224 cm R_{extract} 99 cm R_{inject} 0 cm
HILL PARAMETERS: Gap (min) 19 cm B_{max} 2.1 T
 (@ 6×10^6 AT) Gap (max) cm B_{min} T
VALLEY PARAMETERS: Gap (min) 30 cm B_{max} 1.5 T
 (@ 6×10^6 AT) Gap (max) cm B_{min} T
AVERAGE FIELD: $\langle B \rangle_{\text{min}}$ T $\langle B \rangle_{\text{max}}$ 1.8 T
NUMBER OF SECTORS: compact separated 3 /
 sector angle (h11) 60 deg. spiral (max) 55 deg.
FIELD TRIMMING: Trim Coils 17 circular
 Harmonic Coils 5 valley
 Other
CURRENT: Main Coils 3000 Amps Stability 10^{-3}
 Trim Coils 750-2500 Amps Stability 10^{-3}
 Stored Energy (cryogenic) MJ
WEIGHT: Iron 290 tons Conductor 10 tons
ION ENERGY: Bending Limit E/A = 160 q²/A² MeV/u
 Focusing Limit E/A = 70 q/A MeV/u

ACCELERATION SYSTEM
FUNDAMENTAL ACCELERATION:
 Description: 180 degree dee
 No. of Gaps/turn 2 dE/dn(max) 1 MeV/q
 Voltage (max) 0.5 MV Harmonic f_H/f_{ion} 1, 3, 5, 7
 Freq 5.5 - 16.2 MHz Power in(max) 3 MW
 Stability: Phase Voltage 10^{-3}
OTHER CAVITIES (Flattopping or otherwise):
 Description:
 Region of Influence: R_{min} cm R_{max} cm
 No. of Gaps/turn dE/dn(max) MeV/q
 Voltage (max) MV Harmonic f_H/f_{ion}
 Freq MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM
OPERATING PRESSURE: 7×10^{-7} torr
PUMPS: (No. and type) 2 .81 cm. diff. pumps
 .25 cm. diff. pump, .29 cm. cryopump, 20° K cryopanel

ION SOURCE(S)
 Type Intensity @ $\epsilon_n = \beta\gamma\epsilon$ Ion Species
 (mA) (π mm mrad)
 (a) ECR 2 All ions
 (b) AEGR 5 All ions
 (c) Atomic Beam 3×10^{-3} Pol. H, D
 (d)

INJECTION SYSTEM
 Axial injection 90° mirror Efficiency ~ 50 %

EXTRACTION SYSTEM
 Electrostatic Efficiency 50 %

CHARACTERISTIC BEAMS
 Accelerated Ions E/A (MeV/u) Current (part μ A)
 Internal External
 (a) 16^0_6P 2 - 55 50 25
 (b) 16^0_{19}F 10 3.5
 (c) 15^0_{35}Kr 6.1 0.3
 (d) 15^0_{35}Sm 6.5 .002

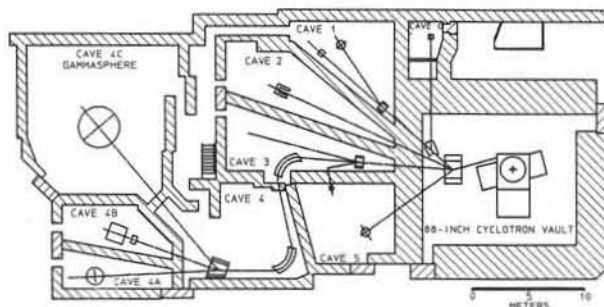
Secondary Particles E (MeV) part/sec
 (a)
 (b)
 (c)

EXTRACTED BEAM PROPERTIES:
 For 5 μ A of 16 MeV/u 4^2He ions
 $\Delta E/E$ 0.3 % $\Delta\phi$ °rf
 $\epsilon_n = \beta\gamma\epsilon$ $\times 3$ π mm mrad z 4 π mm mrad

FACILITIES FOR RESEARCH
 SHIELDED AREA: Fixed: m² Moveable 800 m²
 Target Stations: 11 No. Served At Same Time:
MAGNETIC SPECTROMETERS:
OTHER FACILITIES: Gammasphere 4 π Gamma-ray high resolution spectrometer with 110 Ge detectors.
F.E.A.T. Facility for exotic atom trapping.
 Single Event Upset test facility.

REFERENCES/NOTES
 (a) I.E.E.E. Part. Accel. Conf., May 1991, p. 2796
 (b) Rev. Sci. Instrum. 66(8), Aug. 95, p. 4218.

PLAN VIEW OF FACILITY, COMMENTS



88-INCH CYCLOTRON FACILITY