

**ENTRY NO:**C47

**Date:** 15 Feb 2005 13:48:09

**Machine Name:** 88-Inch Cyclotron

**Institution:** Lawrence Berkeley National Laboratory

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<http://www-nsd.lbl.gov/LBL-Programs/nsd/user88/>

**Person in Charge of Cyclotron:** Claude M. Lyneis

**Person Reporting Information:** Claude M. Lyneis

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### History

**Designed by:** LBNL

**Construction Dates:** 1959-1962

**First Beam Date:** 1962

### Characteristic Beams

Protons	1-55 MeV/N	1.6x10e14	1300
16O6+	10 MeV/N	2x10e13	560
40Ar9+	5 MeV/N	2x10e13	360
48Ca10+	6 MeV/N	6x10e12	280
86Kr19+	5 MeV/N	2.5x10e12	350
136Xe28+	5 MeV/N	6x10e11	110
238U47+	4.5 MeV/N	1.9x10e9	

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

Typical (%): 10%

Best (%): 30%

### Emittance

**Emittance Definition:** 90%

**Vertical (pi mm mrad):** 22 pi mm mRad

**Horizontal (pi mm mrad):** 16 pi mm mRad

**Longitudinal (dE/E[%] x RF[deg.]):** .3x30 deg DelE/E x deg RF

### USES

**Basic Research (%):** 30

**Development (%):** 10

**Therapy (%):**

**Isotope Production (%):**

**Other Application (%):** 25

**Maintenance (%):** 21

**Beam Tuning (%):** 14

**Total Time (h/year):** 4000

### TECHNICAL DATA

#### (a)Magnet

**Type:** compact

**Kb (MeV):** 160

**Kf (MeV/A):** 70

**Average Field (min./max. T):** 1.7

**Number of Sectors:** 3

**Hill Angular Width (deg.):** 60

**Spiral (deg.):** 55

**Pole Diameter (m):** 2.24

**Injection Radius (m):** 0

**Extraction Radius (m):** 1

**Hill Gap (m):** .19

**Valley Gap (m):** .3

#### Trim Coils

**Number:** 17x2

**Maximum Current (A-turns):** 2000

#### Harmonic Coils

**Number:** 5xNsectorsx2

**Maximum Current (A-turns):** 200

#### Main Coils

**Number:** 1x2

**Total Ampere Turns:** 600000

**Maximum Current (A):** 3000

**Stored Energy (MJ):**

**Total Iron Weight (tons):** 290

**Total Coil Weight (tons):** 10

#### Power

**Main Coils (total KW):** 450

**Trim Coils (total, maximum, KW):** 580

**Refrigerator (cryogenic, KW):**

### (b)RF

#### Acceleration

**Frequency Range (MHz):** 5.5-16.0

**Harmonic Modes:** 1,3,5,7

**Number of Dees:** 1

**Number of Cavities:** 1

**Dee Angular Width (deg.):** 180

#### Voltage

**At Injection (peak to ground, KV):** 50

**At Extraction (peak to ground, KV):** 50

Peak (peak to ground, KV): 50

Line Power (max, KW): 300

**Phase Stability (deg.):**

**Voltage Stability (%):** .2

### (c)Injection

**Ion Source:** 2 ECR ion sources

**Source Bias Voltage (kV):** 10-14

**External Injection:** axial

**Buncher Type:** first and second harmonic

**Injection Energy (MeV/n):** .001-.01

**Component:** magnetic solenoids gridded electrostatic mirror

**Injection Efficiency (%):** 30 to 50%

**Injector:**

### (d)Extraction

**Elements, Characteristic:** 3 section electrostatic deflector

**Typical Efficiency (%):** 60%

**Best Efficiency (%):** 90%

### (e)Vacuum

**Pumps:** Diffusion pumps with LN baffles and cryopumps

**Achieved Vacuum (Pa):** 4x10e-5

**REFERENCES** Proceedings of the cyclotron conferences

### EXPERIMENTAL FACILITIES

BGS Berkeley Gas Filled Separator, FEAT Facility for Exotic

Atom Trapping Particle Gamma-ray Facility, BASE Berkeley

Accelerator and Space Effects Facility

### COMMENTS

