

**ENTRY NO:** C-43  
**Machine Name:** 88-Inch Cyclotron  
**Date:** 6/4/01 8:42:56 PM  
**Institution:** Lawrence Berkeley National Laboratory (LBNL)  
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## HISTORY

**Designed By:** LBNL  
**Construction Dates:** 1959-1962  
**First Beam Date:** 1962

## CHARACTERISTIC BEAMS

ions	/ energy(MeV/N)/current(pps)/power(w)
protons	1 - 55 1.6x10e14 1300
16O6+	10 2.2x10e13 560
40Ar9+	5 2x10e13 360
86Kr19+	5 2.5x10e12 350
136Xe28+	5 6x10e11 110
238U47+	4.5 1.9x10e9

## transmission efficiency(source to extract beam)

**typical:** 10% - **best:** 30%

## transverse emittance

**emittance definition:** 90%

**vertical:**  $22\pi$  mm mrad

**horizontal:**  $16\pi$  mm mrad

**longitudinal:**  $.3 \times 30$  deg ( $\Delta$ ) E/E)%xdeg RF

## USES

**basic research:** 71%      **therapy:** %  
**development:** 2%      **isotope production:** %  
**other:** 13%      **maintenance:** 6%  
**beam tuning:** 9%      **Total Time:** 6064h/year

## TECHNICAL DATA

**a)magnet:** **type:** compact  
**Kb:** 160MeV/A    **Kf:** 70MeV/A  
**average field (min/max):** 1.7 T  
**number of magnet sectors:** 3  
**hill angular width:** 60hill angular width  
**spiral (max):** 55 deg  
**pole parameters**  
**diameter:** 2.24 m  
**injection radius:** 0 m  
**extraction radius:** 1 m  
**hill gap:** .19m    **valley gap:** .3m  
**trim coils**  
**-number:** 17x2  
**-current(max):** 2000 A-turns  
**harmonic coils**  
**-number:** 5xNsectorsx2  
**-current(max):** 200 A-turns  
**main coils**  
**number:** 1x2  
**total ampere-turns:** 600000 A-turns  
**current:** 3000 A  
**stored energy:** MJ  
**weight - iron:** 290t    **coils:** 10t  
**power**

**main coils (total):** 450 kW  
**trim coils (total max):** 580 kW  
**refrigerator (cryogenic):** kW

## b)RF

### acceleration

**frequency range:** 5.5 - 16.2MHz

**harmonic modes:** 1,3,5,7  
**number of dees:** 1  
**number of cavities:** 1  
**dee angular width:** 180degrees  
**voltage**  
at injection: 50kV(peak to ground, max)  
at extraction: 50kV(peak to ground, max)  
peak: 50kV(peak to ground, max)  
**line power(max):** 300kW  
**stability**  
**phase:** deg  
**voltage:** .2%  
**injection**  
**c)ion source:** 2 ECR ion sources  
**external injection:** axial  
**components:** magnetic Solenoid lenses, Quaddrupoles, bends, electrostatic mirror  
**source bias voltage:** 10 - 14 kV  
**injection energy:** 0.001 - 0.01MeV/N  
**buncher:** first and second harmonic  
**injection efficiency:** 30 to 50%  
**d)injector:**  
**e)extraction**  
electrostatic deflector Voltage and Gap: up to 90 kV across 6.35 mm Length: 108 degrees three sections Channel shape control: all electrodes remotely movable  
**efficiency**  
**typical:** 60%  
**best:** 90%  
**f)vacuum**  
**pumps:** Diffusion pumps, Cryopumps  
**achieved vacuum:**  $8^*10e-5$ Pa

## REFERENCES

Proceedings of the cyclotron conferences Proceedings of the Seventh European Particle Accelerator Conference, (EPAC 2000), Austria Center Vienna

## EXPERIMENTAL FACILITIES

BGS Berkeley Gas filled Spectrometer GAMMASPHERE FEAT Facility for Exotic Atom Trapping

## COMMENTS

