

Entry: **C13**  
 Machine Name: K130 cyclotron  
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**HISTORY**

Design by: Scanditronix AB, JYFL  
 Construction time: 1988-1990  
 First beam: 1992

**CHARACTERISTIC BEAMS**

ions / energy (MeV/n) / current (pps) / power (W) :  
 - proton / 75 /  $1.2 \times 10^{14}$  / 1500  
 - Ar / 5 /  $10^{12}$  / 25  
 - Ni / 4.7 /  $2 \times 10^{11}$  / 9  
 - Kr / 4.3 /  $6 \times 10^{10}$  / 3

transmission efficiency (total)  
 - typical: 5 - 10 % - best: 15 %

transverse emittance (rms)  
 - vertical:  $< 10 \pi$  mmmrad  
 - horizontal:  $< 10 \pi$  mmmrad

longitudinal emittance (rms)  $\Delta E/E$  deg RF

**USES**

basic research: 85 % therapy: %  
 development: 5 % isotope production: %  
 other applications: 5 % maintenance: %  
 beam tuning: 5 %  
 total time: 6774 h/year

**TECHNICAL DATA**

**a) magnet**

type: compact, normal conducting  
 Kb: 130 MeV Kf: 90 MeV/n  
 average field (min-max): 1.77 (1.3-2.1) T  
 number of magnet sectors: 3  
 - angle: variable (51-81) deg  
 - spiral (max): 58 deg

**pole parameters**

- diameter: 2.40 m  
 - injection radius: 0.0131-0.0188 m  
 - extraction radius: 0.94 m  
 hill gap: 0.174 m valley gap: 0.330 m

**field trimming**

- trim coils  
 - number: 15  
 - current (max): 70-100 A  
 - harmonic coils  
 - number: 4 sets in valleys  
 - current (max): 5 A  
 - others  
 - number:  
 - current (max): A

**main coils:**

- number: 1 pair  
 - Ampere-turns: 400.000 A.T.  
 - current: 1000 A

stored energy: MJ

weight: - iron: 308 t - coils: 15 t

**power**

- main coils (total): 130 kW  
 - trim coils (total max): 22.5 kW  
 - refrigerator (cryogenic): kW

**b) RF**

- acceleration  
 - frequency range: 10-21 MHz  
 - harmonic modes: 1, 2, 3  
 - number of dees: 2  
 - angular aperture: 78 deg  
 - voltage:- average (min-max): 0-50 kV  
 - variation with radius:  
 - power in (max): 100 kW  
 - stability:- phase: deg - voltage: %

**- other cavities**

- purpose:  
 - frequency range: MHz  
 - region of influence: m  
 - voltage (max): kV  
 - power in (max): kW  
 - stability:- phase: deg - voltage: %

**c) injection**

- internal source:  
 - external (radial/axial): axial  
 - elements: dipoles, quadrupoles, soledoids, buncher, spiral inflector  
 - source voltage: 0-20 kV  
 - injection energy: MeV/n  
 - buncher: single gap (1<sup>st</sup> and 2<sup>nd</sup> harm.)  
 - injection efficiency: 50-70 %

**d) ion sources/injector**

ECR + multicusp

**e) extraction**

**- elements, characteristics:**

- electrostatic deflector, 50 kV  
 - electromagnetic channel, 1250 A  
 - passive channels (hor. + vert. focusing)

**- efficiency**

- typical: 70 % - best: 90 %

**f) vacuum**

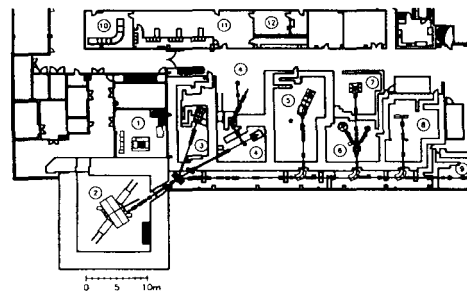
- pumps: 2 cryo pumps 5000 l/s (for nitrogen)  
 - achieved vacuum:  $10^{-5}$  Pa

**REFERENCES**

**EXPERIMENTAL FACILITIES**

Isotope separator on line IGISOL, gas filled recoil separator RITU, gamma detector arrays, high efficiency neutron detector system HENDES, 1.5 m diam. scattering chamber, chamber for radiation defects studies, superconducting electron spectrometer

**PLAN VIEW OF FACILITY**



**COMMENTS**