

**ENTRY NO:** C-14  
**Machine Name:** JULIC  
**Date:** 6/6/01 3:55:57 AM  
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### HISTORY

**Designed By:** AEG Growelzheim  
**Construction Dates:** 1966-1968  
**First Beam Date:** internal 1968 external 1969

### CHARACTERISTIC BEAMS

ions	/ energy(MeV/N)	/current(pps)	/power(w)
H2+	22.5 - 45	6.2 x 10E13	
H-	22.5 - 45	6.2 x 10 E13	
pol H-	22.5 - 45	1 x 10 E13	
D-	22.5 . 45	6 x 10 E13	

### transmission efficiency(source to extract beam)

typical: ———% - best: 21%

### transverse emittance

emittance definition: RMS

vertical:  $6.4\pi$  mm mrad

horizontal:  $3.2\pi$  mm mrad

longitudinal:  $0.3(\Delta) E/E$ %xdeg RF

### USES

basic research: 97%

therapy: ———%

development: 0.5%

isotope production: 0.5%

other: ———%

maintenance: 1.5%

beam tuning: 0.5%

Total Time: ca. 8000h/year

### TECHNICAL DATA

a)magnet: type: solid-pole

Kb: 45MeV/A Kf: ———MeV/A

average field (min/max): 1.35 ( 1.92 / 0.7 ) T

number of magnet sectors: 3

hill angular width: 60hill angular width

spiral (max): 20 deg

### pole parameters

diameter: 3.3 m

injection radius: 0.03 m

extraction radius: 1.54 m

hill gap: 0.084m valley gap: 0.24m

### trim coils

-number: 9x2

-current(max): 960 A-turns

### harmonic coils

-number: ———xNsectorsx2

-current(max): ——— A-turns

### main coils

number: 1x2

total ampere-turns: 151200 A-turns

current: 360 A

stored energy: ———MJ

weight - iron: 800t coils: 12t

### power

main coils (total): 50 kW

trim coils (total max): 12 kW

refrigerator (cryogenic): ——— kW

### b)RF

#### acceleration

frequency range: 20 - 30MHz

harmonic modes: 3

number of dees: 3

number of cavities: ———

dee angular width: 40degrees

#### voltage

at injection:  $\leq 45$ kV(peak to ground, max)

at extraction:  $\leq 30$ kV(peak to ground, max)

peak: ———kV(peak to ground, max)

line power(max): 100kW

#### stability

phase:  $< 1$  deg

voltage:  $< 0.05\%$

#### injection

c)ion source: Multicusp ( H-, D- ) and CBS ( pol. H-, D- )

external injection: axial

components: Hyperboloid Inflector

source bias voltage: ———kV

injection energy: 0.004MeV/N

buncher: 2 x double gap ( sinus / parabolic)

injection efficiency: 30%

d)injector: ———

#### e)extraction

- electrostatic deflector - screening channel - focussing channel

multiturn extraction

#### efficiency

typical: ———%

best: 75%

#### f)vacuum

pumps: 2 turbo 2200l/s each 3 cryo 10000 l/s each

achieved vacuum:  $< 2 \times 10^{-8}$  E-Pa

### REFERENCES

H- Operation of the Cyclotron JULIC as Injector for the Cooler Synchrotron COSY-Jlich, CYCLOTRONS'98, Caen, June 1998

Extraction of D- Beams from the Cyclotron JULIC for injection into the Cooler Synchrotron COSY, CYCLOTRONS'2001, East Lansing, MI, May 2001

### EXPERIMENTAL FACILITIES

The cyclotron JULIC serves as injector for the Cooler Synchrotron COSY Jlich with internal and external target stations 90% of time additionally: - production of radioisotope at the internal irradiation station - investigation of radiation and its effects of Space Electronics at the external station

### COMMENTS

