

ENTRY No. **C45** Cyclotron (AIC-144)  
 NAME OF MACHINE Automatic Isochronous Cyclotron DATE  
 INSTITUTION Institute of Nuclear Physics  
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 IN CHARGE J. Schwabe REPORTED BY J. Schwabe

**HISTORY AND STATUS**

DESIGN, date 1976-78 Model tests 1977-79  
 ENG DESIGN, date 1979  
 CONSTRUCTION, date 1980-85  
 FIRST BEAM, date (or goal) 10.04.87  
 MAJOR ALTERATIONS

COST, ACCELERATOR  
 COST, FACILITY, total  
 FUNDED BY  
 ACCELERATOR STAFF, OPERATION AND DEVELOPMENT  
 SCIENTISTS 7 ENGINEERS 12  
 TECHNICIANS 7 CRAFTS

GRAD STUDENTS involved during year  
 OPERATED BY Research staff or Operators  
 OPERATION hr/wk, On target hr/wk  
 TIME DISTR. in house %, Outside %  
 BUDGET, op & dev  
 FUNDED BY

RESEARCH STAFF, not included above  
 USERS, in house outside  
 GRAD STUDENTS involved during year  
 RESEARCH BUDGET, in house  
 FUNDED BY

**MAGNET**  
 POLE FACE, diameter (compact) 144 cm, R extraction 63,5 cm  
 R injection 0,5-1 cm  
 GAP, min 11,2 cm, Field 20,5 kG }  
 max 22 cm, Field 14,5 kG } at 710(A)x672(W)  
 AVERAGE FIELD at R ext 17,5 kG } Ampere turns  
 B max/ <B> 1,17

NUMBER OF SECTORS { compact 4 } Spiral, max 54 deg  
 { separated }  
 SECTOR ANGLE (SSC) 45 deg  
 TRIMMING COILS circular 15  
 valley 8

CONDUCTOR, material and type Cu  
 STORED ENERGY (cryogenic) MJ  
 POWER: main coils 240 max, kW; current stability  $4 \times 10^{-5}$   
 trimming coils 120 max, kW; current stability  $10^{-5}$   
 WEIGHT: Fe 150 tons; coils 2 x 7,55 tons  
 COOLING system  
 ION ENERGY (bending limit) E/A = 60 (56) q<sup>2</sup>/a<sup>2</sup> MeV/amu  
 (focusing limit) E/A = 60 (56) q<sup>2</sup>/a<sup>2</sup> MeV/amu

**ACCELERATION SYSTEM**

DEES, number 1; angle 180 deg  
 BEAM APERTURE 16 cm; DC Bias kV  
 TUNED by, coarse panels fine trimmers, capac.  
 RF 8 to 26 MHz, stable  $\pm 10^{-7}$   
 Orb F 8 to 26 MHz  
 HARMONICS, RF/Orb F, used 1  
 DEE - Gnd, max 50 kV, min gap 2,79 cm  
 STABILITY, (pk-pk noise)/(pk RF volt)  $10^{-4}$   
 ENERGY GAIN, max 100 kV/turn  
 RF PHASE, stable to  $\pm 15 \div 45$  deg  
 RF POWER input, max 150 kW  
 FREQUENCY MODULATION, rate  $10 \div 1000$  /s  
 modulator, type  
 beam pulse, width-structure; 15,6-4,8 ns; pulse; 1,25  $\mu$ s.

**VACUUM SYSTEM**

OPERATING PRESSURE  $6 \cdot 10^{-6}$  Torr or mbar  
 PUMPS, No, Type, Size 2 diffusion oil pumps 4800 L/S

**ION SOURCES**

Penning Internal

**INJECTION SYSTEM**

Internal or external with electrostatic inflector

**EXTRACTION SYSTEM**

Electrostatic deflector 3 sector

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed m<sup>2</sup>; movable m<sup>2</sup>  
 TARGET STATIONS in rooms  
 STATIONS served at same time, max  
 MAG SPECTROGRAPH, type  
 COMPUTER model  
 OTHER FACILITIES

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT ( $\mu$ A)	
	Goal	Achieved	Internal	External
p	60	-	-	-
d	30	25	> 400	-
$\alpha$	60	52	50	-

**SECONDARY**

(part/s)

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH 35 RF deg  $\mu$ A of 25 MeV d ions  
 PHASE EXC, max RF deg  $\mu$ A of MeV ions  
 EXTRACT eff %  $\mu$ A of MeV ions  
 RESOL  $\Delta E/E$  %  $\mu$ A of MeV ions  
 EMITTANCE  
 ( $\pi$  mm. mrad) { 12 axial }  $\mu$ A of MeV Rd ions  
 { 15 rad }

**OPERATING PROGRAMS, time distribution**

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS  
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS

**REFERENCES/NOTES**

1) International seminar on isochronous  
 Cyclotron technique  
 Poland Krakow J.N.PH. 13  $\div$  18 Nov. 1978  
 report JFJ No. 1069/PL

**PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS**

