

**ENTRY NO. 43**

NAME OF MACHINE KEAGE cyclotron  
 INSTITUTION INSTITUTE FOR CHEMICAL RESEARCH, KYOTO UNIVERSITY  
 ADDRESS AWATAGUCHI TORIICHO, SAKYO-KU, KYOTO 606, JAPAN  
 TEL 075-771-4688 TELEX  
 IN CHARGE Hidekuni TAKEKOSHI REPORTED BY Hidekuni TAKEKOSHI

**HISTORY AND STATUS**

DESIGN, date 1951 Model tests  
 ENG DESIGN, date 1952  
 CONSTRUCTION, date 1954  
 FIRST BEAM, date (or goal) 1955  
 MAJOR ALTERATIONS change from two dee to one dee system  
 COST, ACCELERATOR  
 COST, FACILITY, total  
 FUNDED BY Ministry of Education

**ACCELERATOR STAFF, OPERATION AND DEVELOPMENT**  
 SCIENTISTS 2 ENGINEERS 1  
 TECHNICIANS CRAFTS  
 GRAD STUDENTS involved during year 3  
 OPERATED BY Research staff or 1 Operator  
 OPERATION 25 hr/wk. On target 20 hr/wk  
 TIME DISTR. in house 20 % Outside 80 %  
 BUDGET, op & dev \$70k  
 FUNDED BY Ministry of Education

**RESEARCH STAFF**, not included above  
 USERS, in house 4 outside 5  
 GRAD STUDENTS involved during year 10  
 RESEARCH BUDGET, in house \$40k  
 FUNDED BY Ministry of Education

**MAGNET**  
 POLE FACE, diameter (compact) 105 cm, R extraction 94 cm  
 R injection cm  
 GAP, min 14.4 cm, Field 17.5 kG }  
 min cm, Field kG } at  $1.50 \times 2380 = 3.1 \times 10^5$   
 AVERAGE FIELD at R ext kG } Ampere turns  
 B max/ < B > 17.5 kG }  
 NUMBER OF SECTORS { compact } Spiral, max deg  
 { separated }  
 SECTOR ANGLE (SSC) deg  
 TRIMMING COILS

CONDUCTOR, material and type copper (0.25x3 cm)  
 STORED ENERGY (cryogenic) MJ  
 POWER: main coils 50 max, kW; current stability  $5 \times 10^{-5}$   
 trimming coils max, kW; current stability  
 WEIGHT: Fe 71.3 tons; coils 8.5 tons  
 COOLING system oil cooling and heat exchanger  
 ION ENERGY (bending limit) E/A = 7.5 q<sup>2</sup>/a<sup>2</sup> MEV/amu  
 (focusing limit) E/A = q/a MeV/amu

**ACCELERATION SYSTEM**  
 DEES, number 1 180 deg  
 BEAM APERTURE cm; DC Bias kV  
 TUNED by, coarse shorting plate fine loop inductance  
 RF 11 to 18 MHz, stable ±  
 Orb F to MHz  
 HARMONICS, RF/Orb F, used  
 DEE-Gnd, max 110 kV, min gap 2.2 cm  
 STABILITY, (pk-pk noise)/(pk RF volt)  
 ENERGY GAIN, max 220 kV/turn  
 RF PHASE, stable to ± deg  
 RF POWER input, max 120 kW  
 FREQUENCY MODULATION, rate /s  
 modulator, type  
 beam pulse, width

**VACUUM SYSTEM**  
 OPERATING PRESSURE  $1 \times 10^{-5}$  Torr or mbar  
 PUMPS, No, Type, Size one 10,000 l/sec. oil diffusion pump  
 one booster pump and 3 rotary pumps

**ION SOURCES**  
 double axes, fooded arc, hair pin filament.

**INJECTION SYSTEM**

**EXTRACTION SYSTEM**

electrostatic deflector and magnetic channel

**FACILITIES FOR RESEARCH**

SHIELDED AREA, fixed 1,000 m<sup>2</sup>, movable m<sup>2</sup>  
 TARGET STATIONS in  
 STATIONS served at same time, max  
 MAG SPECTROGRAPH type broad range spectrometer  
 COMPUTER model HP2100  
 OTHER FACILITIES scattering chamber, PIXE equipment,  
 biological irradiation equipment, hot laboratory,

**CHARACTERISTIC BEAMS**

PARTICLE	ENERGY (MeV)		CURRENT (pA)	
	Goal	Achieved	Internal	External
H <sup>+</sup>	7.5	7	40 pA	10 pA
D <sup>+</sup>	15	14	80 pA	20 pA
He <sup>2+</sup>	30	28	10 pA	2.5 pA

**SECONDARY** (part/s)  
 fast neutron

**BEAM PROPERTIES**

MEASURED CONDITIONS  
 PULSE WIDTH RF deg pA of MeV ions  
 PHASE EXC. max RF deg pA of MeV ions  
 EXTRACT eff 25 % pA of MeV ions  
 RESOL ΔE/E % pA of MeV ions  
 EMITTANCE { axial } pA of MeV  
 (π mm. mrad) { rad }

**OPERATING PROGRAMS**, time distribution  
 BASIC NUCLEAR PHYSICS 25% SOLID STATES PHYSICS 15%  
 BIOMEDICAL APPLICAT 10% ISOTOPE PRODUCTIONS 50%

**REFERENCES/NOTES**

- 1) Bull. of Inst. Chem. Res., Kyoto Univ. 39, 368 (1961).
- 2) ibid, 52, 70 (1974).
- 3) ibid, 52, 87 (1974).

**PLAN VIEW OF FACILITY, COMMENTS, ETC.**