ENTRY NO. 40

NAME OF MACHINE INS Sector Focusing Cyclotron(INS-SF) DATE 7/14/78
INSTITUTION Institute for Nuclear Study, University of Tokyo
ADDRESS 3-2-1, Tanashi, Tokyo, Japan

IN CHARGE Y. Hirao REPORTED by M. Sekiguchi

HISTORY AND STATUS

DESIGN, date 1968 MODEL tests 1968-1970
ENG. DESIGN, date 1969-1970
CONSTRUCTION, date 1969-1973
FIRST BEAM date (or goal) Extracted, 1974
MAJOR ALTERATIONS New deflector system, 2nd on-line computer
OPERATION, 132 hr/wk; On Target ∿100 hr/wk
TIME DIST., in house (*) %, outside (*) %
USERS' SCHEDULING CYCLE ∿4 weeks
COST, ACCELERATOR 3×10^8 yen(†)
COST, FACILITY, total 7×10^8 yen(†)
FUNDED BY Japan Ministry of Education

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 4 ENGINEERS 3
TECHNICIANS 2 CRAFTS 2
GRAD STUDENTS involved during year 0
OPERATED BY 1/2 Res staff or 1/2 Operators
BUDGET, op & dev 4×10^7 yen(†)
FUNDED BY Japan Ministry of Education

RESEARCH STAFF, not included above

USERS, in house 9 outside ∿20
GRAD STUDENTS involved during year ∿ 5
RES. BUDGET, in house 5×10^7 yen(†)
FUNDED BY Japan Ministry of Education

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 530 m^2
movable 0 m^2
TARGET STATIONS 11 in 5 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type QDD(original design)
COMPUTER, model TOSBAC 40C and FACOM U400
OTHER FACILITIES 80cm dia. scatt. chamber, Semi-circular scatt. chamber for pγ correl., In-Beam γ ray facility, Water-cooled target station for RI production, On-line mass separator

REFERENCES/NOTES

INS Internal Reports, INS-J-131(1971), INS-J-133(1972), INS-J-138(1972), INS-J-139(1972), INS-J-154(1975), Proceedings of the 7th Cyclotron Conf., p.103 and p.312(1975)
*Time is assigned by Program Committee. No distinction is made between inhouse and outside proposals.
†Salaries are not included.

MAGNET

POLE FACE diameter 168 cm; R extraction 73 cm
GAP, min 14.6 cm; Field 19.5 kG
max 22.8 cm; Field 13.2 kG
} at 0.38 x 10^6 ampere turns
AVERAGE FIELD at R ext 16.4 kG
CURRENT STABILITY 10 parts/10^6; $B_{max}/\langle B \rangle$ 1.19
NUMBER OF SECTORS 3 ; SPIRAL, max 55 deg
POLE FACE COIL PAIRS: AVF /sec;
Harmonic correction 7/3
Rad grad /sec or Circ coils 11
WEIGHT: Fe 130 tons; Coils 5 tons
CONDUCTOR, Material and type Copper and MI cable
STORED ENERGY ∿4 MJ
COOLING SYSTEM Oil and demineralized water
POWER: Main coils 260 max, kW
Trimming coils 60 max, kW
YOKE/POLE AREA 100 %
SECTOR ANGLE (Sep Sec) - deg
ION ENERGY (Bending limit) E/A = 68 q^2/A^2 MeV
(Focusing limit) E/A = 48 q/A MeV

ACCELERATION SYSTEM

DEES, number 1 angle 180 deg
BEAM APERTURE 4 cm; DC BIAS 0 kV
TUNED by, coarse Short. Pl. fine 2 Trim. Cap.
RF 7.5 to 22.5 mHz, stable ± < 10 /10^6
Orb F 2.5 to 22.5 mHz; GAIN, max 160 kV/turn
HARMONICS, RF/Orb F, used 1 , 3
DEE-Gnd, max 80 kV, min gap 0.7 cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.001
RF PHASE stable to ± deg
RF POWER input, max 360 kW
RF PROTECT circuit, speed ∿1 μsec
Type Ignitron crowbar
FREQUENCY MODULATION, rate /sec
MODULATOR, type
BEAM PULSE, width

VACUUM SYSTEM

PUMPS, No., Type, Size 36 inch and 10 inch oil diffusion pumps
OPERATING PRESSURE 1 μTorr,
PUMPDOWN TIME 8 hrs

ION SOURCES/INJECTION SYSTEM

Hot cathode (A≤4) and cold cathode (A>4) PIG, Vert. Inj. for p and d

EXTRACTION SYSTEM

2 channel dc deflector

CONTROL SYSTEM

Conventional

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CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p	48	35
	α	68	68
	$^{14}N^{5+}$	118	115
	$^{20}Ne^{6+}$	119	115
CURRENT		(μA)	(μA)
Internal	p		>500
	α		>200
External	p		∿10
	$^{14}N^{5+}$		4.3
	$^{20}Ne^{6+}$		1.5
		(part/s)	(part/s)
Secondary			

BEAM PROPERTIES

	Measured		Conditions			
Pulse Width	15 RF deg	1	μA of 60	MeV	α
Phase Exc, max	RF deg		μA of	MeV	
Extract Eff	60 %	8	μA of 82	MeV	^3He
Res, ΔE/E	0.3 %	1	μA of 67	MeV	α
Emittance					
(mm-mrad) 25 axial, 18 radial		5	μA of 14	MeV	p

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	∿ 90 %
Solid State Physics	%
Bio-Medical Applications	%
Isotope Production	%
Development	∿ 10 %
	%
	%

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, OPERATION SUMMARY, ADDITIONAL REFERENCES

A storage ring of heavy ion beams will be installed in a room adjacent to the SF cyclotron facility by the end of 1978. The ring is used to solve technical problems encountered in constructing a big synchrotron for heavy ions, the NUMATRON (cf."NUMATRON" published by The Study Group of Numatron, INS, 1977). Some kinds of heavy ions are planned to be injected into the test ring from the SF cyclotron through the beam line 2B-3.