ENTRY NO. 48

NAME OF MACHINE INS SF Cyclotron DATE April, 1984

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IN CHARGE Y. Hirao REPORTED BY Y. Sakurada

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 Deflector system (1978)
MOPA rf system (1980)

COST, ACCELERATOR $\sim 3 \times 10^8$ yen

COST, FACILITY, total $\sim 7 \times 10^8$ 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 Research staff or 1/2 Operators

OPERATION 140 hr/wk. On target 100 hr./wk

TIME DISTR. in house % Outside %

BUDGET, op & dev 1.0×10^8 yen

FUNDED BY Japan Ministry of Education

RESEARCH STAFF, not included above

USERS, in house 15 outside 50

GRAD STUDENTS involved during year 2

RESEARCH BUDGET, in house 5×10^7 yen

FUNDED BY Japan Ministry of Education

MAGNET

POLE FACE, diameter (compact) 168 cm, R extraction 73 cm

R injection cm

GAP, min 14.6 cm, Field 19.5 kG
min 22.8 cm, Field 13.2 kG } at 3.8×10^5 Ampere turns

AVERAGE FIELD at R ext 16.4 kG

B max/ < B > 1.19

NUMBER OF SECTORS { compact 3 / separated } Spiral, max 55 deg

SECTOR ANGLE (SSC) deg

TRIMMING COILS 11 sets of circular
7 sets of harmonic correction

CONDUCTOR, material and type Cu and MI cable

STORED ENERGY (cryogenic) MJ

POWER: main coils 260 max, kW; current stability 10^{-5}

trimming coils 60 max, kW; current stability 10^{-3}

WEIGHT: Fe 130 tons; coils 5 tons

COOLING system Oil and demineralized water

ION ENERGY (bending limit) E/A = 68 q^2/a^2 MEV/amu

(focusing limit) E/A = 48 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 1 ; angle 180 deg

BEAM APERTURE 4 cm; DC Bias 0 kV

TUNED by, coarse Short plate fine 2 Trim. cap., auto

RF 7.4 to 22.5 mHz, stable ± 10^{-7}

Orb F 0.9 to 22.5 mHz

HARMONICS, RF/Orb F, used 1,3,5,7,9

DEE—Gnd, max 70 kV, min gap cm

STABILITY, (pk-pk noise)/(pk RF volt) 2×10^{-4}

ENERGY GAIN, max 70 q kV/turn

RF PHASE, stable to ± deg

RF POWEP input, max 150 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 5×10^{-7} Torr or mbar

PUMPS, No, Type, Size 36 inch and 10 inch oil diffusion pumps

ION SOURCES

Internal filament and cold cathode PIG

INJECTION SYSTEM

Axial injection for $\vec{p}$ and $\vec{d}$

EXTRACTION SYSTEM

2 channel dc deflector

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 950 m²; movable m²

TARGET STATIONS 11 in 6

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type QDD

COMPUTER model FACOM U400, M360R

OTHER FACILITIES 80 cm dia. scatt. chamber, semi-circular scatt. chamber for pγ-correl., Inbeam γ-ray facility, One-line isotope separator

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV) Goal	ENERGY (MeV) Achieved	CURRENT (pμA) Internal	CURRENT (pμA) External
p	48	45		10
α	68	68		5
$^{23}Na^{4+}$		41		0.1
$^{27}Al^{5+}$		55		0.2
SECONDARY		(part/s)		

BEAM PROPERTIES

MEASURED		CONDITIONS				
PULSE WIDTH	15 RF deg	1	pμ A of	60 MeV	α	ions
PHASE EXC. max	RF deg		pμ A of	MeV		ions
EXTRACT eff	80 %	5	pμ A of	45 MeV	p	ions
RESOL ΔE/E	0.1 %	1	pμ A of	22 MeV	p	ions
EMITTANCE (π mm. mrad)	18 axial / 13 rad	0.1	pμ A of	50 MeV	α	ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 90 SOLID STATES PHYSICS 2

BIOMEDICAL APPLICAT 3 ISOTOPE PRODUCTIONS 5

REFERENCES/NOTES

1) Proc. 7th Cyclotron Conf., p.103 and 312(1975)

2) Proc. 8th Cyclotron Conf., P.1984(1978)

PLAN VIEW OF FACILITY, COMMENTS, ETC.