ENTRY NO. 39

NAME OF MACHINE IMS (IKAKEN) Cyclotron DATE 7/31/78
INSTITUTION The Institute of Medical Science, The Univ. of Tokyo
ADDRESS Minato-ku, Tokyo 108, JAPAN

IN CHARGE Akira ITO REPORTED by Akira ITO

HISTORY AND STATUS

DESIGN, date _____ MODEL tests _____
ENG. DESIGN, date TCC model CS-30
CONSTRUCTION, date 1971-1973
FIRST BEAM date (or goal) Aug. 1973
MAJOR ALTERATIONS replacement of magnet coils (1976)
OPERATION, 50 hr/wk; On Target 40 hr/wk
TIME DIST., in house 90 %, outside 10 %
USERS' SCHEDULING CYCLE 1 weeks
COST, ACCELERATOR about $1M (1973)
COST, FACILITY, total about $1M (1973)
FUNDED BY Japanese Government

ACCELERATOR STAFF, OPERATION and DEVELOPMENT

SCIENTISTS 1 ENGINEERS _____
TECHNICIANS 3 CRAFTS _____
GRAD STUDENTS involved during year _____
OPERATED BY X Res staff or X Operators
BUDGET, op & dev $0.4M (1978)
FUNDED BY Japanese Government

RESEARCH STAFF, not included above

USERS, in house 6 outside 10
GRAD STUDENTS involved during year 2
RES. BUDGET, in house _____
FUNDED BY _____

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 330 m^2
movable 0 m^2
TARGET STATIONS 6 in 4 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type _____
COMPUTER, model PDP-8L, PDP-11/40
OTHER FACILITIES
Isotopes production
Neutron therapy
Neutron TOF
In beam X & gamma spectroscopy

REFERENCES/NOTES

Y.Yoshida et al., Nucl. Instr. & Meth., Vol.138,pp.579-788(1976).

MAGNET

POLE FACE diameter 96 cm; R extraction 42 cm
GAP, min 5 cm; Field 20 kG
max 10 cm; Field 12 kG
AVERAGE FIELD at R ext 16 kG
} at 0.2 x 10^6 ampere turns
CURRENT STABILITY 100 parts/10^6; $B_{max}/\langle B \rangle$ 1.25
NUMBER OF SECTORS 3 ; SPIRAL, max 60 deg
POLE FACE COIL PAIRS: AVF 1 /sec;
Harmonic correction 2(inner&outer)/sec.
Rad grad _____ /sec or Circ coils _____
WEIGHT: Fe 23 tons; Coils 1 tons
CONDUCTOR, Material and type Cu hollow
STORED ENERGY _____ MJ
COOLING SYSTEM demineralized water
POWER: Main coils 60 max, kW
Trimming coils _____ max, kW
YOKE/POLE AREA 100 %
SECTOR ANGLE (Sep Sec) _____ deg
ION ENERGY (Bending limit) E/A = _____ q^2/A^2 MeV
(Focusing limit) E/A = 30 q/A MeV

ACCELERATION SYSTEM

DEES, number 2 angle 90 deg
BEAM APERTURE 4 cm; DC BIAS -1.5 kV
TUNED by, coarse short bar fine V.C.
RF 14 to 26 mHz, stable ± 10 /10^6
Orb F _____ to _____ mHz; GAIN, max 40 kV/turn
HARMONICS, RF/Orb F, used _____
DEE-Gnd, max 30 kV, min gap 1 cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.1%
RF PHASE stable to ± 5 deg
RF POWER input, max 75 kW
RF PROTECT circuit, speed 50 μsec
Type driver tube crowbar
FREQUENCY MODULATION, rate _____ /sec
MODULATOR, type _____
BEAM PULSE, width _____

VACUUM SYSTEM

PUMPS, No., Type, Size one diffusion pump (30cm dia.)
OPERATING PRESSURE less than 10 μTorr,
PUMPDOWN TIME 1 hrs

ION SOURCES/INJECTION SYSTEM

PIG type (internal only)

EXTRACTION SYSTEM

DC deflector + mag. channel

CONTROL SYSTEM

manual

ENTRY NO. 39 (cont.)

CHARACTERISTIC BEAMS

	Particle	Goal (MeV)	Achieved (MeV)
ENERGY	p		26
	d		14
	^{3}He		38
	α		28
CURRENT		(μA)	(μA)
Internal	p, d		500
	^{3}He		150
	α		100
External	p		70
	d		150
	^{3}He		70
	α		50
		(part/s)	(part/s)
Secondary	Be(d,n) $\bar{E}$n=6MeV		5×10^{12}

BEAM PROPERTIES

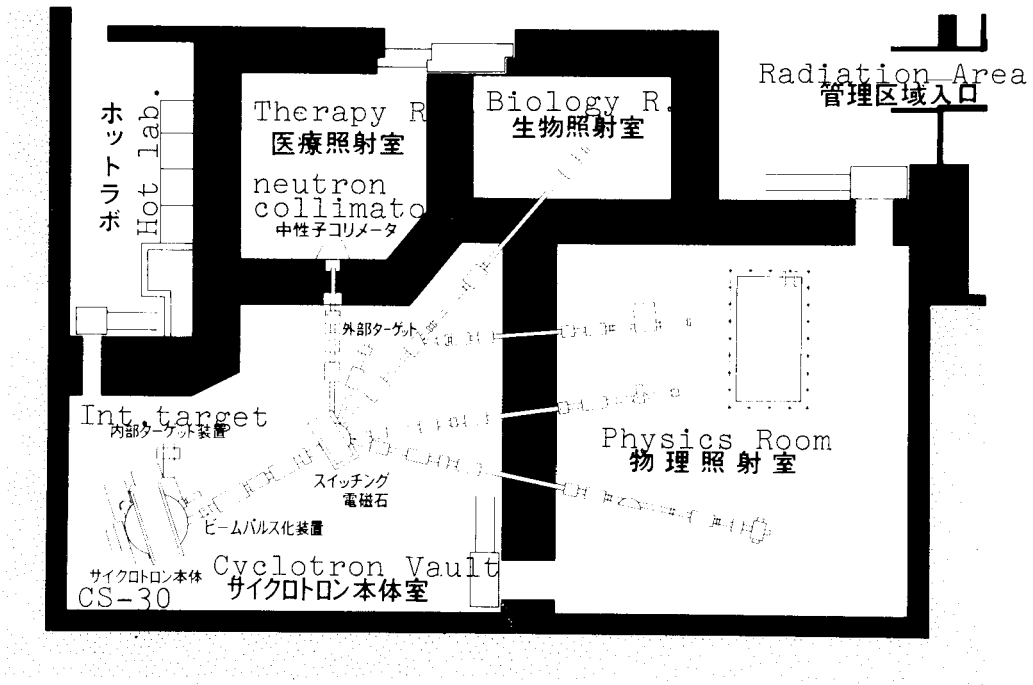
	Measured	Conditions
Pulse Width	10 RF deg	1 μA of 28 MeV α
Phase Exc, max	RF deg	μA of MeV
Extract Eff	60 %	100 μA of 14 MeV d
Res, ΔE/E	1 %	1 μA of 14 MeV d
Emittance		
(mm-mrad)	10 axial, 14 radial	1 μA of 14 MeV d

OPERATING PROGRAMS, time dist

Basic Nuclear Physics	%
Solid State Physics	20 %
Bio-Medical Applications	60 %
Isotope Production	10 %
Development	10 %
	%
	%

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

1) Plan view of IMS cyclotron



2) External beam pulsing system Using horizontal and vertical RF deflector system, beam period can be selected from 160 ns(p), 200ns(^{3}He) and 280 ns(d&α) to infinite.

3) Fast neutron irradiation facility For medical and biological study, the neutron target and collimator system is facilitated, which yields the neutron dose of about 40 rad/min./100μAd at 125 cm SSD.