

ENTRY No. 37

NAME OF MACHINE NIRS Isochronous Cyclotron... DATE July 1981
 INSTITUTION National Institute of Radiological Sciences
 ADDRESS 4-9-1, Anagawa, Chiba, JAPAN
 TEL 0472-51-2111... TELEX 03722-205
 IN CHARGE T. Kondo... REPORTED BY H. Ogawa

HISTORY AND STATUS

CGR-Mev Model 930

DESIGN, date Model tests
 ENG DESIGN, date
 CONSTRUCTION, date 1972~1973
 FIRST BEAM, date (or goal) Dec. 1973
 MAJOR ALTERATIONS

COST, ACCELERATOR
 COST, FACILITY, total
 FUNDED BY the Science and Technology Agency

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 3... ENGINEERS 1
 TECHNICIANS 5... CRAFTS

GRAD STUDENTS involved during year
 OPERATED BY Research staff or 5... Operators
 OPERATION 38... hr/wk, On target
 TIME DISTR. in house 100... %, Outside %
 BUDGET, op & dev
 FUNDED BY the same as the above

RESEARCH STAFF, not included above

USERS, in house outside
 GRAD STUDENTS involved during year
 RESEARCH BUDGET, in house
 FUNDED BY the same as the above

MAGNET

POLE FACE, diameter (compact) 215. cm, R extraction 92. cm
 R injection cm
 GAP, min 16.6 cm, Field 16.5 kG }
 max 40.5 cm, Field 8.6 kG } at 0.28×10^6
 AVERAGE FIELD at R ext 14 kG } Ampere turns
 B max/

NUMBER OF SECTORS { compact 4... } Spiral, max 53 deg
 separated

SECTOR ANGLE (SSC) deg
 TRIMMING COILS 12 circular coils
 Harmonic coils 2 per sector

CONDUCTOR, material and type Cu, hollow
 STORED ENERGY (cryogenic) MJ
 POWER: main coils 225 max, kW; current stability $\pm 2 \times 10^{-5}$
 trimming coils 75 max, kW; current stability $\pm 1 \times 10^{-4}$

WEIGHT: Fe 200 tons; coils 6 tons
 COOLING system Demineralized water

ION ENERGY (bending limit) E/A = ~ 90 q²/a² MeV/amu
 (focusing limit) E/A = ~ 93 q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 86 deg
 BEAM APERTURE 3.8 cm; DC Bias 0 kV
 TUNED by, coarse MP, fine MP, auto
 RF 10.6 to 22.0 MHz, stable $\pm \leq 1 \times 10^{-6}$
 Orb F 5.3 to 19.4 MHz

HARMONICS, RF/Orb F, used 1, 2
 DEE - Gnd, max 50 kV, min gap 4 cm
 STABILITY, (pk-pk noise)/(pk RF volt) 0.001

ENERGY GAIN, max 200 kV/turn
 RF PHASE, stable to ± 0.5 deg
 RF POWER input, max 160 kW

FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 2×10^{-6} Torr or mbar
 PUMPS, No, Type, Size 2 x 22" Oil diffusion pumps

ION SOURCES

Hot filament for light ions and Penning for heavy ions

INJECTION SYSTEM**EXTRACTION SYSTEM**

Electrostatic deflector and magnetic channels (active and passive)

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 376 m²; movable m²

TARGET STATIONS 7 in 4 rooms

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type

COMPUTER model

OTHER FACILITIES Radionuclide Production, Fast neutron and Proton Radiotherapy Facilities

CHARACTERISTIC BEAMS

| PARTICLE | ENERGY (MeV) | | CURRENT (μ A) | |
|-----------------|--------------|----------|--------------------|----------|
| | Goal | Achieved | Internal | External |
| P | | 8~73 | | 20 |
| d | | 12~43 | | 40 |
| ³ He | | 24~100 | | 15 |
| α | | 32~86 | | 10 |
| SECONDARY | | | (part/s) | |

BEAM PROPERTIES

MEASURED CONDITIONS
 PULSE WIDTH .25 RF deg 20 μ A of 30 MeV d ions
 PHASE EXC, max RF deg μ A of MeV ions
 EXTRACT eff .80 % .35 μ A of 30 MeV d ions
 RESOL $\Delta E/E$ % μ A of MeV ions
 EMITTANCE

(π mm. mrad) { axial } μ A of MeV ions
 { rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
 BIOMEDICAL APPLICAT. 68% ISOTOPE PRODUCTIONS 32%

REFERENCES/NOTES

H. Ogawa et al. IEEE NS-26, No2, 1988-1991 (1979)

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS