ENTRY No. 74

NAME OF MACHINE — DATE 6 February 1989

INSTITUTION KING FAISAL SPECIALIST HOSPITAL AND RESEARCH CENTRE, RADIONUCLIDE AND CYCLOTRON OPERATIONS DEPARTMENT

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IN CHARGE RICHARD M. LAMBRECHT REPORTED BY DALE KEN WELLS

HISTORY AND STATUS

DESIGN, date — Model tests

ENG DESIGN, date TCC Model CS-30

CONSTRUCTION, date Factory Tests: March 1977

FIRST BEAM, date (or goal) January 1982 (in Riyadh)

MAJOR ALTERATIONS Improved internal target delivery system used in medical radionuclide production

COST, ACCELERATOR -

COST, FACILITY, total -

FUNDED BY Kingdom of Saudi Arabia

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 9 Ph.D.'s in Dept ENGINEERS 1

TECHNICIANS 5 CRAFTS 3

GRAD STUDENTS involved during year

OPERATED BY — Research staff or 100% Operators

OPERATION 75 hr/wk, On target Scheduled 65hr/wk

TIME DISTR. in house 100 %, Outside %

BUDGET, op & dev

FUNDED BY Kingdom of Saudi Arabia

RESEARCH STAFF, not included above

USERS, in house 20 outside 18 hospitals use products

GRAD STUDENTS involved during year 1

RESEARCH BUDGET, in house Yes

FUNDED BY Kingdom of Saudi Arabia

MAGNET

POLE FACE, diameter (compact) 96.5 cm, R extraction 42. cm

R injection cm

GAP, min 5 cm, Field 19.5 kG
max 10 cm, Field 12 kG } at

AVERAGE FIELD at R ext 16 kG } Ampere turns

B max/ <B>

NUMBER OF SECTORS { compact / separated 3 } Spiral, max 60 deg

SECTOR ANGLE (SSC) deg

TRIMMING COILS

CONDUCTOR, material and type Copper, hollow

STORED ENERGY (cryogenic) MJ

POWER: main coils 60 max, kW ; current stability

trimming coils max, kW ; current stability

WEIGHT: Fe 20 tons ; coils tons

COOLING system D.I. Water

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

(focusing limit) E/A = q^2/a^2 MeV/amu

ACCELERATION SYSTEM

DEES, number 2 ; angle 90 deg

BEAM APERTURE 2.5 cm ; DC Bias 1.5 kV

TUNED by, coarse Shorting bar fine

RF 14 to 26 mHz, stable ±

Orb F to mHz

HARMONICS, RF/Orb F, used

DEE - Gnd, max 35 kV, min gap 1 cm

STABILITY, (pk-pk noise)/(pk RF volt)

ENERGY GAIN, max 100 kV/turn

RF PHASE, stable to ± deg

RF POWER input, max 70 kW

FREQUENCY MODULATION, rate /s

modulator, type

beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 3×10^{-5} Torr or mbar

PUMPS, No, Type, Size 1 Diffusion pump, 10 inch

ION SOURCES

"Cold Cathode" (1)

INJECTION SYSTEM

EXTRACTION SYSTEM

Electrostatic and Magnetic Channel (2)

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed 190 m² ; movable None m²

TARGET STATIONS 9 in 4 rooms

STATIONS served at same time, max 1

MAG SPECTROGRAPH, type 101.5° analyzing magnet

COMPUTER model Laboratories for radiopharmaceutical

OTHER FACILITIES Chemistry, Radiopharmaceutical Manufacturing, PET Program in Development

CHARACTERISTIC BEAMS (In Routine Use)

PARTICLE	ENERGY (MeV) Goal	Achieved	CURRENT (pμA) Internal	External
p	26	26.5	200	60
d	15	14.8	300	90
^{3}He	38	38.1	135	20
α	30	29.6	90	20

SECONDARY (part/s)

Neutrons 27 Rad/min @ 125 cm

BEAM PROPERTIES

	MEASURED	CONDITIONS
PULSE WIDTH	RF deg	pμ A of MeV ions
PHASE EXC, max	RF deg	pμ A of MeV ions
EXTRACT eff	%	pμ A of MeV ions
RESOL ΔE/E	%	pμ A of MeV ions

EMITTANCE

(π mm. mrad) { axial / rad } pμA of MeV ions

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 0% SOLID STATES PHYSICS 0%

BIOMEDICAL APPLICAT. 65% ISOTOPE PRODUCTIONS 30%

CYCLOTRON R&D 5%

REFERENCES/NOTES

(1) IEEE TRANS. NULC. SCI. NS-14, 70-71 (1967)

(2) IEEE TRANS. NUCL. SCI. NS-16, 500-503 (1969)

(3) "Status Report of the King Faisal Specialist Hospital and Research Centre Cyclotron Facility." 11th Intl. Symposium on Cyclotrons and Applications. Ionics, Tokyo (1987) pp. 678-681.

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

(1) Radiopharmaceuticals and Radiochemicals are produced and distributed to 24 different hospitals in the Kingdom, Adjoining States, and to North America.

(2) A PET Program is in development at this department as a National Resource.

(3) A isocentric neutron production beam is used in treatment of some patients with stage 4 oral cancers.

(4) Program emphasis is Research and Development of short-lived medical radionuclides for medical applications (i.e. diagnostic and therapeutic and therapeutic radiopharmaceuticals).