

ENTRY NO. CUI21 Date July 1992
 Name of Machine Clinical Cyclotron
 Institution University of Washington Medical Center
 Address Department of Radiation Oncology, RC-08, Seattle WA 98195 USA
 Tel (206) 548-4112 Telex 4740096 UW UI Fax (206) 548-6218 EMAIL RISLER@RADONC.WASHINGTON.EDU
 In Charge: R. Risler Reported by: R. Risler

HISTORY
MILESTONE DATES:
 Design 1980 Model Tests 1980
 Construction 1981-1984 First Beam Factory JUN 82
 Facility JUN 83
DESIGN/CONSTRUCTION BY:
 in house other Scanditronix AB, Uppsala
COST: Accelerator 4.2 mio. USD Facility 7.0 mio. USD
FUNDED BY: US National Cancer Institute

STATUS
STAFF: Machine
 Scientists Engineers 2
 Technicians 3 Students
 Research (in house/external)
 Scientists Engineers /
 Technicians Students /
BUDGET: Machine 360000 USD Funded by Hospital + some
 Research excl. staff. Funded by grants
TIME DISTRIBUTION:
 Basic Research (in house/external) 5 % /
 Applied Program (in house/external) 85 % /
 Development 5 % Maintenance 5 %

MAGNET
POLE PARAMETERS:
 Diameter 155 cm R_{extract} 57 cm R_{inject} 7 cm
HILL PARAMETERS: Gap (min) 11.5 cm B_{max} 2.05 T
 (0 AT) Gap (max) 11.5 cm B_{min} T
VALLEY PARAMETERS: Gap (min) 20.5 cm B_{max} T
 (0 AT) Gap (max) 20.5 cm B_{min} T
AVERAGE FIELD: < B > min T < B > max 1.75 T
NUMBER OF SECTORS: compact/separated 3 /
 sector angle deg. spiral (max) 55 deg.
FIELD TRIMMING: Trim Coils 10
 Harmonic Coils 4 sets
 Other
CURRENT: Main Coils 900 A max. Amps Stability 10⁻³
 Trim Coils 50-80 A max. Amps Stability 10⁻³
 Stored Energy (cryogenic) MJ
WEIGHT: Iron 90000 kg Conductor 3800 kg
ION ENERGY: Bending Limit E/A = 51 q²/A² MeV/u
 Focussing Limit E/A = q/A MeV/u

ACCELERATION SYSTEM
FUNDAMENTAL ACCELERATION:
 Description: two 90 deg. Dees
 No. of Gaps/turn 4 dE/dn(max) 0.160 MeV/q
 Voltage(max) 0.040 MV Harmonic f_{rf}/f_{ion} 1/2
 Freq 19.5-26 MHz Power in(max) 0.060 MW
 Stability: Phase +/- 1deg Voltage 10
OTHER CAVITIES (Flattopping or otherwise):
 Description:
 Region of Influence: R_{min} cm R_{max} cm
 No. of Gaps/turn dE/dn(max) MeV/q
 Voltage(max) MV Harmonic f_{rf}/f_{ion}
 Freq MHz Power in(max) MW
 Stability: Phase Voltage

VACUUM SYSTEM
 OPERATING PRESSURE: 10⁻⁶ mbar
 PUMPS: No. and type 2 oil diffusion pumps (Edwards L9
 fluid), total capacity 8500 liters/sec

ION SOURCE(S)
 Type Intensity (mA) $\epsilon_n = \beta\gamma\epsilon$ (mm mrad) Ion Species
 (a) Internal Cold Cathode PIG R, d, 3He, 4He
 (b) with dual chimney
 (c)
 (d)

INJECTION SYSTEM
 Efficiency %

EXTRACTION SYSTEM
 Eject. Def., EMC, 2 passive foc. ch. Efficiency 75-85 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part μ A)	
		Internal	External
(a) R	28 - 50.5	90	70
(b) d	15 - 24	65	50
(c) 3He ⁺⁺	21 - 35	3	2.2
(d) 4He ⁺⁺	30 - 48	1	0.75

Secondary Particles E (MeV) part/sec
 (a)
 (b)
 (c)

EXTRACTED BEAM PROPERTIES:
 For 1 μ A of 50.5 MeV/u R ions
 $\Delta E/E$ % $\Delta\phi$ °
 $\epsilon_n = \beta\gamma\epsilon$ x 12 mm mrad z 14 mm mrad

FACILITIES FOR RESEARCH
SHIELDED AREA: Fixed 265 m² Moveable 0 m²
 Target Stations: 3 No. Served At Same Time: 1
MAGNETIC SPECTROMETERS:
OTHER FACILITIES: Isocentric Neutron Therapy Room
 Fixed Beam Neutron Therapy Room
 Isotope Production Station in Cyclotron Vault (PET)

REFERENCES/NOTES
 (a) R. Risler et al. CONTINUED OPERATION OF THE SEATTLE
 (b) CLINICAL CYCLOTRON FACILITY (this conference)

PLAN VIEW OF FACILITY, COMMENTS

