

ENTRY No. 95

NAME OF MACHINE Cyclo-Graaff Injector DATE 8/1/81
INSTITUTION Triangle Universities Nuclear Laboratory
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IN CHARGE E. G. Bilpuch REPORTED BY F. U. Purser

HISTORY AND STATUS

DESIGN, date 1964 Model tests
ENG DESIGN, date 1963
CONSTRUCTION, date
FIRST BEAM, date (or goal) Factory 1966, site 1968
MAJOR ALTERATIONS Additional Harmonic Coils, Phase Limiting Slits, Moveable Magnetic Channel
COST, ACCELERATOR Cyclotron \$ 360,000, FN Tandem
COST, FACILITY, total \$ 3,945 M \$ 1,25M
FUNDED BY DOE, NSF, HEW, N.C., Duke Univ.
ACCELERATOR STAFF, OPERATION AND DEVELOPMENT
SCIENTISTS 19 ENGINEERS
TECHNICIANS 4 CRAFTS 4
GRAD STUDENTS involved during year
OPERATED BY X Research staff or Operators
OPERATION 168 hr/wk, On target 140 hr/wk
TIME DISTR. in house 100% , Outside %
BUDGET, op & dev \$ 900,000
FUNDED BY DOE
RESEARCH STAFF, not included above
USERS, in house outside
GRAD STUDENTS involved during year
RESEARCH BUDGET, in house
FUNDED BY
MAGNET
POLE FACE, diameter (compact) 80 cm, R extraction 33.5 cm
R injection cm
GAP, min 5 cm, Field 12 kG }
max 10 cm, Field 20.5 kG } at 167,00
AVERAGE FIELD at R ext 16.4 kG } Ampere turns
B max/ 1.25
NUMBER OF SECTORS { compact 3 } Spiral, max deg
separated
SECTOR ANGLE (ISS) 45 deg
TRIMMING COILS
CONDUCTOR, material and type Hollow Core Copper
STORED ENERGY (cryogenic) MJ
POWER: main coils 30 max, kW; current stability 6×10^{-5}
trimming coils max, kW; current stability
WEIGHT: Fe 14 tons; coils tons
COOLING system water
ION ENERGY (bending limit) E/A = 15 q²/a² MeV/amu
(focusing limit) E/A = q²/a² MeV/amu
ACCELERATION SYSTEM
DEES, number 2; angle 120 deg
BEAM APERTURE 2.05 cm; DC Bias 1.0 kV
TUNED by, coarse moveable strapfine moveable plate
RF 12.8 to 25.0 MHz, stable ± 1 KHz
Orb F to MHz
HARMONICS, RF/Orb F, used Fundamental only
DEE - Gnd, max 40 kV, min gap cm
STABILITY, (pk-pk noise)/(pk RF volt) 0.002
ENERGY GAIN, max 120 kV/turn
RF PHASE, stable to ± 5 deg
RF POWER input, max 40 kW
FREQUENCY MODULATION, rate /s
modulator, type
beam pulse, width
VACUUM SYSTEM
OPERATING PRESSURE 1×10^{-6} Torr or mbar
PUMPS, No, Type, Size 1-10" Diffusion Pump
N₂ traps
ION SOURCES
Ehlers Penning Ion Gauge

INJECTION SYSTEM

Axial
EXTRACTION SYSTEM
Harmonic Resonance, Electrostatic Deflector, Mag. Channel
FACILITIES FOR RESEARCH
SHIELDED AREA, fixed 1000 m²; movable m²
TARGET STATIONS 9 in 3 rooms
STATIONS served at same time, max 1
MAG SPECTROGRAPH, type
COMPUTER model DEC VAX 11/780
OTHER FACILITIES

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (μ A)	
	Goal	Achieved	Internal	External
H	15	15	100	25
D	8	8	50	10

SECONDARY

(part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
PULSE WIDTH 18 RF deg 20 μ A of 15 MeV H⁺ ions
PHASE EXC, max RF deg μ A of MeV ions
EXTRACT eff 30% μ A of MeV ions
RESOL $\Delta E/E$ 0.3% μ A of MeV ions
EMITTANCE
(π mm. mrad) { 20 axial } 10 μ A of 15 MeV H⁺ ions
rad
OPERATING PROGRAMS, time distribution
BASIC NUCLEAR PHYSICS SOLID STATES PHYSICS
BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS
Basic Nuclear Physics 100%

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

Beam properties with internal phase limiting slits
Pulse with 3.2 R.F. Deg. 1.5 μ A of 15 MeV H⁺
Res. $\Delta E/E$ 0.1%
Burst Length 0.5 ns.