

ENTRY No. 5 IPEN - Variable Energy
 NAME OF MACHINE Cyclotron CV-28 DATE 25/07/81
 INSTITUTION INSTITUTO DE PESQUISAS ENERGETICAS E NUCLEARES
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HISTORY AND STATUS

DESIGN, date before 1970 Model tests July 1977
 ENG DESIGN, date 1971
 CONSTRUCTION, date 1976 - 1977
 FIRST BEAM, date April, 23 1981 (internal)
 MAJOR ALTERATIONS none

COST, ACCELERATOR US 1.1 x 10⁶
 COST, FACILITY, total US 2.0 x 10⁶
 FUNDED BY São Paulo State Govmnt

ACCELERATOR STAFF, OPERATION AND DEVELOPMENT

SCIENTISTS 1 ENGINEERS 1
 TECHNICIANS 3 CRAFTS
 GRAD STUDENTS involved during year
 OPERATED BY Research staff or 4 Operators
 OPERATION 10 hr/wk, On target hr/wk
 TIME DISTR. in house 100%, Outside %
 BUDGET, op & dev
 FUNDED BY São Paulo State Govmnt

RESEARCH STAFF, not included above
 USERS, in house 8 outside
 GRAD STUDENTS involved during year
 RESEARCH BUDGET, in house
 FUNDED BY

MAGNET

POLE FACE, diameter (compact) .96 cm, R extraction .42 cm
 R injection 2.5 cm
 GAP, min 5.6 cm, Field .21 kG }
 max 1.0.0 cm, Field 14.2 kG } at 0.20 x 10¹⁶
 AVERAGE FIELD at R ext 18.5 kG } Ampere turns
 B max/ 1.14

NUMBER OF SECTORS { compact } Spiral, max 50 deg
 separated 3
 SECTOR ANGLE (SSC) deg
 TRIMMING COILS 3

CONDUCTOR, material and type Copper
 STORED ENERGY (cryogenic) MJ
 POWER: main coils .75 max, kW; current stability 0.1%
 trimming coils .50 max, kW; current stability 1.0%
 WEIGHT: Fe 23 tons; coils 14 tons
 COOLING system demineralized water
 ION ENERGY (bending limit) E/A = q²/a² MeV/amu
 (focusing limit) E/A = q/a MeV/amu

ACCELERATION SYSTEM

DEES, number 2; angle 90 deg
 BEAM APERTURE 2 cm; DC Bias 2.5 kV
 TUNED by, coarse MSP fine VC
 RF 6.0 to 25.5 MHz, stable ±
 Orb F 6.0 to 25.5 MHz
 HARMONICS, RF/Orb F, used 1
 DEE - Gnd, max .30 kV, min gap 1.3 cm
 STABILITY, (pk-pk noise)/(pk RF volt)
 ENERGY GAIN, max 100 kV/turn
 RF PHASE, stable to ± deg
 RF POWER input, max 75 kW
 FREQUENCY MODULATION, rate /s
 modulator, type
 beam pulse, width

VACUUM SYSTEM

OPERATING PRESSURE 10⁻⁵ Torr or mbar
 PUMPS, No, Type, Size Diff. - one 12"-three 3"
 Mechanical - Six

ION SOURCES

Penning

INJECTION SYSTEM

Electrostatic Injector

EXTRACTION SYSTEM

Electrostatic Deflector + Magnetic Channel

FACILITIES FOR RESEARCH

SHIELDED AREA, fixed .84 m²; movable .184 m²
 TARGET STATIONS 3 in 3 rooms
 STATIONS served at same time, max 1
 MAG SPECTROGRAPH, type
 COMPUTER model
 OTHER FACILITIES Pneumatic "Rabbit" transfer station
 Isotope Production Station Material Research Station

CHARACTERISTIC BEAMS

PARTICLE	ENERGY (MeV)		CURRENT (pμA)	
	Goal	Achieved	Internal	External
protons	24	24	9.0	-
deuterons	14	14	6.8	-
He	36	-	-	-
He ³⁺⁺	28	28	1.0	-

SECONDARY (part/s)

BEAM PROPERTIES

MEASURED CONDITIONS
 PULSE WIDTH RF deg pμA of MeV ions
 PHASE EXC, max RF deg pμA of MeV ions
 EXTRACT eff % pμA of MeV ions
 RESOL ΔE/E % pμA of MeV ions
 EMITTANCE
 (π mm. mrad) { axial } pμA of MeV ions
 { rad }

OPERATING PROGRAMS, time distribution

BASIC NUCLEAR PHYSICS 20% SOLID STATES PHYSICS 20%
 BIOMEDICAL APPLICAT. ISOTOPE PRODUCTIONS 40%
 Development 20%

REFERENCES/NOTES

PLAN VIEW OF FACILITY, NOTEWORTHY FEATURES, COMMENTS

