

ENTRY NO. CM5 Date October 9, 1995
 Machine Name CYCLONE 30
 Manufacturer ION BEAM APPLICATIONS (IBA)
 Address Rue Jean Lenoir 6 - 1348 Louvain-la-Neuve, BELG
 Tel 32-10-47.58.11 Telex
 Fax 32-10-47.58.10 E-MAIL
 In Charge: Yves JONGEN Reported by: Pascal COHILIS

HISTORY AND STATUS

DATES: Design 1985 First Machine 1986
 SALES: No. Sold/Operational 16 / 16 Currently Available Y
 COST: Accelerator Facility

MAGNET
POLE PARAMETERS:

Diameter 160 cm $R_{extract}$ 50-75 cm R_{inject} 3 cm
 HILL PARAMETERS: Gap (min) 3 cm B_{max} 1.7 T
 (@ 60.000 AT) Gap (max) 3 cm B_{min} T
 VALLEY PARAMETERS: Gap (min) 100 cm B_{max} 0.12 T
 (@ AT) Gap (max) 100 cm B_{min} T
 AVERAGE FIELD: $\langle B \rangle_{min}$ 1.0 T $\langle B \rangle_{max}$ 1.3 T
 NUMBER OF SECTORS: compact/separated 4 /
 sector angle 54-58 deg. spiral (max) 0 deg.
 FIELD TRIMMING: Trim Coils None
 Harmonic Coils None
 Other
 CURRENT: Main Coils 110 Amps Stability 5×10^{-5}
 Trim Coils N/A Amps Stability N/A
 Stored Energy (cryogenic) N/A MJ
 WEIGHT: Iron 45 Tons Conductor 4 Tons
 ION ENERGY: Bending Limit E/A = 30 q^2/A^2 MeV/u
 Focusing Limit E/A = 30 q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description: 2 x 30° Dees on $\lambda/2$ Vertical Stems
 No. of Gaps/turn 4 $dE/dn(max)$ 0.17 MeV/q
 Voltage (max) 0.055 MV Harmonic f_r/f_{ion} 4
 Freq 66 MHz Power in(max) 0.025 MW
 Stability: Phase Voltage 10^{-3}

VACUUM SYSTEM

OPERATING PRESSURE: $2.5 \cdot 10^{-7}$
 PUMPS: (No. and type) 3 x 2,000 l/sec ODP + 2 x 1,500
 l/sec (N₂) cryo's

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ (π mm mrad)	Ion Species
(a) Multicusp	3		H ⁺ , d ⁺
(b) Multicusp	7		

INJECTION SYSTEM
 Axial Efficiency 35 %

EXTRACTION SYSTEM
 Stripping Efficiency 100 %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part. μ A)	
		Internal	External
(a) Protons (H ⁺)	30	500	500
(b) Protons (H ⁺)	30	1000	1000

EXTRACTED BEAM PROPERTIES: (a)
 For 500 μ A of 30 MeV/u Protons ions
 $\Delta E/E$ 1 % $\Delta\phi$ *rf
 $\epsilon_n = \beta\gamma\epsilon$ x 10 π mm mrad z 5 π mm mrad

REFERENCES/NOTES
 (a) ACC 92, Y. Jongen et al., St-Petersburg, 1992
 (b) EPAC 1990, Y. Jongen et al., Nice, 1990

ENTRY NO. CM6 Date October 9, 1995
 Machine Name CYCLONE 235
 Manufacturer ION BEAM APPLICATIONS (IBA)
 Address Rue Jean Lenoir 6 - 1348 Louvain-la-Neuve, BELGI
 Tel 32-10-47.58.11 Telex
 Fax 32-10-47.58.10 E-MAIL
 In Charge: Yves JONGEN Reported by: Pascal COHILIS

HISTORY AND STATUS

DATES: Design 1992 First Machine 1995
 SALES: No. Sold/Operational 1 / 0 Currently Available Y
 COST: Accelerator Facility

MAGNET
POLE PARAMETERS:

Diameter 224 cm $R_{extract}$ 108 cm R_{inject} 1 cm
 HILL PARAMETERS: Gap (min) 0.9 cm B_{max} 3.2 T
 (@ AT) Gap (max) 9.6 cm B_{min} 1.7 T
 VALLEY PARAMETERS: Gap (min) 40 cm B_{max} 1.4 T
 (@ AT) Gap (max) 60 cm B_{min} 0.9 T
 AVERAGE FIELD: $\langle B \rangle_{min}$ 1.7 T $\langle B \rangle_{max}$ 2.15 T
 NUMBER OF SECTORS: compact/separated 4 /
 sector angle 54 deg. spiral (max) 60 deg.
 FIELD TRIMMING: Trim Coils
 Harmonic Coils 4
 Other
 CURRENT: Main Coils 760 Amps Stability
 Trim Coils Amps Stability
 Stored Energy (cryogenic) MJ
 WEIGHT: Iron 20000 kg Conductor 10000 kg
 ION ENERGY: Bending Limit E/A = 240 q^2/A^2 MeV/u
 Focusing Limit E/A = 240 q/A MeV/u

ACCELERATION SYSTEM

FUNDAMENTAL ACCELERATION:
 Description:
 No. of Gaps/turn 4 $dE/dn(max)$ 0.45 MeV/q
 Voltage (max) 0.14 MV Harmonic f_r/f_{ion} 4
 Freq 107 MHz Power in(max) 0.1 MW
 Stability: Phase Voltage $5 \cdot 10^{-4}$

VACUUM SYSTEM

OPERATING PRESSURE: $1 \cdot 10^{-5}$ mbar
 PUMPS: (No. and type) Two 2000 l/s diffusion pumps

ION SOURCE(S)

Type	Intensity (mA)	@ $\epsilon_n = \beta\gamma\epsilon$ (π mm mrad)	Ion Species
(a) PIG	< 0.1		H ⁺
(b)			

INJECTION SYSTEM
 Efficiency %

EXTRACTION SYSTEM
 Electrostatic Efficiency %

CHARACTERISTIC BEAMS

Accelerated Ions	E/A (MeV/u)	Current (part. μ A)	
		Internal	External
(a) H ⁺	< 240		
(b)			

EXTRACTED BEAM PROPERTIES:
 For 300 nA of 235 MeV/u H⁺ ions
 $\Delta E/E$ 0.5 % expected $\Delta\phi$ *rf
 $\epsilon_n = \beta\gamma\epsilon$ x 3.8 π mm mrad z 1.5 π mm mrad

REFERENCES/NOTES
 (a) Yves Jongen et al., EPAC 1994, London
 (b)