

ENTRY NO. CM7 Date September 1995  
 Machine Name TR13  
 Manufacturer Ebco Technologies  
 Address 7851 Alderbridge Way, Richmond, B.C.  
 Tel (604) 278-5578 Telex Canada V6X 2A4  
 Fax (604) 278-7230 E-MAIL  
 In Charge: Reported by: B. Milton

**HISTORY AND STATUS**

DATES: Design 1991 First Machine 1994  
 SALES: No. Sold/Operational 2 / 2 Currently Available Yes  
 COST: Accelerator Facility

**MAGNET**

**POLE PARAMETERS:**

Diameter cm R<sub>extract</sub> 45 cm R<sub>inject</sub> 2.5 cm  
 HILL PARAMETERS: Gap (min) 3.2 cm B<sub>max</sub> 1.9 T  
 (@ AT) Gap (max) 4 cm B<sub>min</sub> T  
 VALLEY PARAMETERS: Gap (min) 10 cm B<sub>max</sub> .55 T  
 (@ AT) Gap (max) 20 cm B<sub>min</sub> T  
 AVERAGE FIELD: <B><sub>min</sub> 1.20 T <B><sub>max</sub> 1.22 T  
 NUMBER OF SECTORS: compact/separated 4 /  
 sector angle 40-45 deg. spiral (max) none deg.  
 FIELD TRIMMING: Trim Coils none  
 Harmonic Coils none  
 Other  
 CURRENT: Main Coils 475 Amps Stability 0.02%  
 Trim Coils none Amps Stability  
 Stored Energy (cryogenic) MJ  
 WEIGHT: Iron Conductor  
 ION ENERGY: Bending Limit E/A = 18 q<sup>2</sup>/A<sup>2</sup> MeV/u  
 Focusing Limit E/A = 18 q/A MeV/u

**ACCELERATION SYSTEM**

**FUNDAMENTAL ACCELERATION:**

Description: 2 pie shape dees with lambda/4 stems  
 No. of Gaps/turn 4 dE/dn(max) 0.200 MeV/q  
 Voltage (max) 0.050 MV Harmonic f<sub>r</sub>/f<sub>ion</sub> 4  
 Freq 73 MHz Power in(max) .015 MW  
 Stability: Phase 1 Voltage 10<sup>-4</sup>

**VACUUM SYSTEM**

OPERATING PRESSURE: 1 x 10<sup>-6</sup> Torr  
 PUMPS: (No. and type) 1 cryo pump

**ION SOURCE(S)**

Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (mm mrad)	Ion Species
(a) Cusp	1		0.7	H <sup>-</sup>
(b)				

**INJECTION SYSTEM**

.. Axial - Spiral Efficiency 12 %

**EXTRACTION SYSTEM**

.. Stripping Efficiency 100 %

**CHARACTERISTIC BEAMS**

Accelerated Ions	E/A (MeV/u)	Current (part. $\mu$ A)	Internal	External
(a) H <sup>-</sup>	13	100	H <sup>-</sup>	100 p
(b)				

**EXTRACTED BEAM PROPERTIES:**

For 100  $\mu$ A of 13 MeV/u H<sup>+</sup> ions  
 $\Delta E/E$  1 %  $\Delta\phi$  30 °rf  
 $\epsilon_n = \beta\gamma\epsilon$  x 2  $\pi$  mm mrad z 2  $\pi$  mm mrad

**REFERENCES/NOTES**

(a) ..  
 (b) ..

ENTRY NO. CM8 Date September 1995  
 Machine Name TR30 + TR30/15  
 Manufacturer Ebco Technologies  
 Address 7851 Alderbridge Way, Richmond, B.C. Canada V6X  
 Tel (604) 278-5578 Telex  
 Fax (604) 278-7230 E-MAIL  
 In Charge: Reported by: B. Milton

**HISTORY AND STATUS**

DATES: Design 1988-89 First Machine July 1, 1990  
 SALES: No. Sold/Operational 2 / 2 Currently Available Yes  
 COST: Accelerator Facility

**MAGNET**

**POLE PARAMETERS:**

Diameter 76 cm R<sub>extract</sub> 47-66 cm R<sub>inject</sub> 2.5 cm  
 HILL PARAMETERS: Gap (min) 3.5 cm B<sub>max</sub> 1.9 T  
 (@ .9 x 10<sup>5</sup> AT) Gap (max) 5.2 cm B<sub>min</sub> 1.3 T  
 VALLEY PARAMETERS: Gap (min) 18 cm B<sub>max</sub> 1.1 T  
 (@ .9 x 10<sup>5</sup> AT) Gap (max) 18 cm B<sub>min</sub> 0.4 T  
 AVERAGE FIELD: <B><sub>min</sub> 1.2 T <B><sub>max</sub> 1.24 T  
 NUMBER OF SECTORS: compact/separated 4 /  
 sector angle 32-45 deg. spiral (max) none deg.  
 FIELD TRIMMING: Trim Coils none  
 Harmonic Coils none  
 Other  
 CURRENT: Main Coils 500 Amps Stability 0.01%  
 Trim Coils Amps Stability  
 Stored Energy (cryogenic) MJ  
 WEIGHT: Iron 45 tonnes Conductor 1 tonne  
 ION ENERGY: Bending Limit E/A = 30 q<sup>2</sup>/A<sup>2</sup> MeV/u  
 Focusing Limit E/A = 30 q/A MeV/u

**ACCELERATION SYSTEM**

**FUNDAMENTAL ACCELERATION:**

Description: 2 pie shape dees with lambda/4 stems  
 No. of Gaps/turn 4 dE/dn(max) 0.200 MeV/q  
 Voltage (max) 0.050 MV Harmonic f<sub>r</sub>/f<sub>ion</sub> 4  
 Freq 73, 14 MHz Power in(max) 0.035 MW  
 Stability: Phase 1° Voltage 10<sup>-4</sup>

**VACUUM SYSTEM**

OPERATING PRESSURE: 3 x 10<sup>-7</sup> Torr  
 PUMPS: (No. and type) 2 cryo pumps

**ION SOURCE(S)**

Type	Intensity (mA)	@	$\epsilon_n = \beta\gamma\epsilon$ (mm mrad)	Ion Species
(a) Cusp	7		0.7	H <sup>-</sup> , D <sup>-</sup>
(b)				

**INJECTION SYSTEM**

.. Axial - spiral Efficiency 12 %

**EXTRACTION SYSTEM**

.. Stripping Efficiency 100 %

**CHARACTERISTIC BEAMS**

Accelerated Ions	E/A (MeV/u)	Current (part. $\mu$ A)	Internal	External
(a) H <sup>-</sup>	30	450	H <sup>-</sup>	450 p
(b) D <sup>-</sup>	15	150	H <sup>-</sup>	150 p

**EXTRACTED BEAM PROPERTIES:**

For 400  $\mu$ A of 30 MeV/u H<sup>+</sup> ions  
 $\Delta E/E$  1 %  $\Delta\phi$  30 °rf  
 $\epsilon_n = \beta\gamma\epsilon$  x 2  $\pi$  mm mrad z 2  $\pi$  mm mrad

**REFERENCES/NOTES**

(a) 12th International Cyclotron Conf., B. Milton et al.  
 (b) PAC 1991, B. Milton et al.