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Sezione Acceleratore: LIST OF PARAMETERS OF THE ITALIAN
ELECTRON-SYNCHROTRON.

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LIST OF PARAMETERS OF THE ITALIAN ELECTRON SYNCHROTRON *

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We collect here a number of informations about the Italian electron synchrotron, which may be useful in understanding the preceding notes.

The main data are the following :

Maximum energy	$E_{max} = 1000 \text{ Mev}$
Maximum induction on the principal orbit	$\dot{B}_{max} = 9260 \text{ GS}$
Principal orbit radius	$R = 360 \text{ cm.}$
Number of straight sections	$= 4$
Nominal length of the straight sections	$L = 120.6 \text{ cm.}$
Field index	$n = 0.61$
Injection energy (total)	$E_i = 2.5 \text{ Mev}$
Injection induction on the principal orbit	$B_i = 22.7 \text{ GS}$
Average gap height	$= 8.6 \text{ cm.}$
Width of the free pole surface	$= 22.7 \text{ cm.}$
Injector	Cockcroft Walton
Magnet excitation	Sinusoidal 20 periods ($\Omega = 125.66 \text{ sec.}^{-1}$) with adjustable bias between 4170-4630 gauss

Other useful numerical data are :

Final revolution period	$T_{\infty} = 9.154 \times 10^{-8} \text{ sec.}$
Radiation energy loss per turn at 1000 Mev	$L_r = 25 \text{ Kev}$
Number of oscillations per turn (vertical)	$Q_v = 0.863$
(horizontal)	$Q_h = 0.688$
Velocity at injection	$v_i = 0.9789 \text{ C}$
Injection revolution period	$T_i = 9.35 \times 10^{-8} \text{ sec.}$
Radio-frequency cavities	2
Harmonic	$k = 4$

R.F. final frequency	$\nu = 43.70 \text{ MHz}$
R.F. injection frequency	$\nu_i = 42.78 \text{ MHz}$
Frequency modulation	2.11 %

On varying the continuous component (B_b , bias) of the magnetic field we cover a range of spiralizations (defined by

$$\left(\frac{dB}{dt}\right)_i = B_i \frac{(1-n)}{T_i} \frac{\sigma}{R}, \text{ at injection}$$

from about 0.2 to 0.6 cm.

We have

$\sigma = 0.2 \text{ cm}$ for $B_i = 53000 \text{ Gs/sec}$ or $E_i = 5550 \text{ Mev/sec}$
 $\sigma = 0.6 \text{ cm}$ for $B_i = 158000 \text{ Gs/sec}$ or $E_i = 16600 \text{ Mev/sec}$

The magnet has C shaped sections with external doughnut
 The poles are independent from the C's

Magnet main data are :

Iron weight	$= 9.3 \times 10^4 \text{ Kg.}$
Number of copper turns per quadrant	12
Copper weight about	$0.8 \div 1 \times 10^4 \text{ Kg.}$
Average maximum induction in Iron about	14.000 Gs
Magnet inductance	$= 18.5 \times 10^{-8} \text{ henry}$
Maximum energy in air	$= 2.65 \times 10^5 \text{ Joule}$

Excitation main data are :

Capacitor bank in parallel with the magnet :	
Power	$= 10.560 \text{ kVA}$ (at 20 periods)
Capacity	$= 3420 \text{ Farad}$
Choke coil inductance value	45 mhenry
Capacitor bank in parallel with choke coil :	
Power	$= 4300 \text{ kVA}$
Capacity	$= 1400 \text{ farad}$
Power of the a.c. generator	$= 510 \text{ kVA}$

* This paper was presented in title only.

Power of the d.c. generator = 315 kW

Injector characteristics are :

Pressure in the tank : 15 atmos. (of N₂ with about 10% CO₂ or freon).

Approximate dimensions

length	5 m.
width	3.5 m.
height	3.5 m.

The tank is made of stainless steel.

Maximum current 200 mA.

Pulse duration : from 1 to 10⁷ sec.

Angular spread of the beam at injection (after the electrostatic deflector) about 6×10^{-8} rad; section of the beam at injection about 1×1 cm².

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