

Muon Beam Phase Correlation LINAC for 100 Cells, 200 MeV, 100 ns

November 1999

ref.: Muon_Dec99_1.ppt

Study Plan & Schedule

- Based on Norbert Holtkamp's requirements
 - Conceptual design to 1 Dec 99
 - Preliminary design to mid Jan 00
 - Full System Review @ Fermi Lab end of Jan 00
 - Detailed Preliminary design to mid Feb 00
 - Final report due 1 Mar 00

Core Scaling

- Requirements
 - 2MV quasi-linear ramp for 100 ns => $V\tau = 140 \text{ mV}\cdot\text{s}$
 - 20 cm bore radius & 25 cm for B_z magnet & Insulator => $R_{\text{inner}} = 45 \text{ cm}$
 - < 1.0 MW for 4 pulse burst @ 15 Hz
- Metglass 2605SC
 - $3.3e-2 \text{ m}^2 = A_{\text{Met}}$, $6.7e-2 \text{ m}^2 = A_{\text{core}}$
 - $8100 \text{ J/m}^3 = E_{\text{core}}$
 - $9.2e-2 \text{ m}^3 = V_{\text{met}}$ => 746 J per shot = $E(2\text{MeV})$
 - 4.5 MW system exceeds 1.0 MW allowance
- Metglass 2714A
 - $0.16 \text{ m}^2 = A_{\text{Met}}$, $0.35 \text{ m}^2 = A_{\text{core}}$, $PF_r = 0.7$, $PF_a = 0.64$ => $R_{\text{outer}} = 83 \text{ cm}$
 - $188 \text{ J/m}^3 = E_{\text{core}}$, 0.9 T out of 1.1 T for I up factor of 2 => $H = 219 \text{ A/m}$
 - $R_{\text{mean}} = 64 \text{ cm} \Rightarrow 0.9 \text{ kA} = I_{\text{core}}$
 - Use $I_{\text{cell}} = 1.5 \text{ kA} \Rightarrow 210 \text{ J / pulse} = E(2\text{MeV})$
 - **1.3 MW system**
- Glued CN-20 Ferrite ala SLIA similar to 2714A

Spark Gap Scaling

- Ft. Monmouth & RR-1 PPU gaps => 80 kCb lifetime @ 100 kV
 - 8.0 e9 J/gap
- 1.3 kA, 100 ns => 0.13 mCb/ pulse @ 200 MV
 - 2.6e4 J/pulse
- 3e8 pulses/year
 - 7.8e12 J/year => 1000 gaps/year No good!
- Will use saturable reactors with either solid state switches or Thyatrons

200 MeV, 0.5 kA Muon Beam Induction Linac Block Diagram 1 of a total of 100 Cells

