WHY STUDY A MUON COLLIDER?

- Synchrotron radiation power is REDUCED

$$P_\gamma[MW] \approx 0.026 E^3[GeV] I[A] B[T] \left(\frac{m_e}{m_\mu}\right)^4$$

$$\left(\frac{m_e}{m_\mu}\right) = 4.8 \times 10^{-3} \approx \frac{1}{207}$$

Hence, circular accelerator is possible (Size $\approx$ 3 Km)

- High Luminosity

$$\mathcal{L}_\mu \approx \frac{1}{8\pi c^2 \alpha m_\mu r_\mu} \frac{P_{\text{beam}}}{\sigma_r} \frac{n_\gamma}{\gamma} N_{\text{number}-\text{of}-\text{crossings}}$$

$$\mathcal{L}_\mu = \mathcal{L}_{\text{e}} \left(\frac{m_\mu}{m_e}\right) N_{\text{number}-\text{of}-\text{crossings}}$$

- Compact machine. μ's can be recirculated in CEBAF-like structures.

- Energy of beam is precisely defined due to small synchrotron radiation.
  Studies of s-channel resonances.

- Full energy of the beam is available for production of new particles.

- Both beams can be partially polarized albeit at the cost of luminosity.

- Energy could be increased over time.
  Beams of muons, neutrinos, kaons possibility of new physics. In particular, neutrino physics, rare kaon and rare muon decay experiments ($\mu \to e + \gamma$)

- $\boxed{\text{THERE ARE DIFFICULTIES !}}$