

E. ELECTRON-POSITRON COLLIDING BEAMS AND SEQUENTIAL LEPTONS

At this meeting my good friend Gustav Voss gave the history of electron-positron colliding beam machines. He has given a detailed history with references, and so here I simply need to set the atmosphere with respect to the discovery of the τ . By September 1967 at the Sixth International Conference on High Energy Accelerators, Howard²³ was able to list quite a few electron-positron colliders. There was the pioneer 500 MeV ADA collider already operated at Frascati in the early 1960's and, also at Frascati, ADONE was under construction. The 1 GeV ACO at Orsay and 1.4 GeV VEPP-2 at Novosibirsk were in operation. The 6 GeV CEA Collider at Cambridge was being tested. And, colliders had been proposed at DESY and SLAC.²⁴

The 1964 SLAC proposal²⁴, Fig. 2, already discussed the reaction

$$e^+ + e^- \rightarrow x^+ + x^-$$

and gave the total production cross section as

$$\sigma = \frac{\pi}{3} r_e^2 \left(\frac{m_e}{E}\right)^2 \beta \left[1 + \frac{(1-\beta^2)}{2}\right]$$

where r_e is the classical electron radius. This proposal did not directly lead to the construction of an e^+e^- collider at SLAC because we could not get the funding. About 5 years later with the steadfast support of the SLAC director, Wolfgang Panofsky, and with a design and construction team led by Burton Richter, construction of the SPEAR e^+e^- collider was begun at SLAC, Fig. 1.

It was this 1964 proposal and the 1961 seminal paper of Cabibbo and Gatto²⁵ entitled "Electron-Positron Colliding Beam Experiments" which focussed my thinking on new charged lepton searches using an e^+e^- collider. As we carried out the experiments described in Sections C and D, I kept looking for a model for new leptons, a model which would lead to definitive colliding beam searches while remaining reasonably general. Helped by discussions