The initial history of measurements of the τ mass, m_τ, is brief. The first estimate $m_\tau = 1.6$ to 2.0 GeV/c was made along with the initial evidence for the τ.[35] By the beginning of 1978 the DASP experiment at the DORIS e^+e^- storage ring showed $m_\tau = 1807 \pm 20$ MeV/c^2.[53]

By the middle of 1978 the DELCO experiment at SPEAR (Bacino *et al.*[43]) had made the best measurement $m_\tau = 1784^{+2}_{-7}$ MeV/c^2 as reported in a paper entitled "Measurement of the Threshold Behavior of $\tau^+\tau^-$ Production in e^+e^- Annihilation". This paper contained the classic measurement of the τ pair production cross section at low energy. (It was only in 1992, fourteen years later, that there was an improvement in the measurement of m_τ, the BES Collaboration using the BEPC e^+e^- collider reported[54] $m_\tau = 1776.9 \pm 0.5$ MeV/c^2.)

N. THE TAU LIFETIME

The last major property of the τ to be determined was the τ lifetime. Measurements of the τ lifetime, τ_τ, could not be made at the energies at which SPEAR and DORIS operated; the first measurement of τ_τ required the higher energies of PETRA and PEP. The best measurements required, in addition, secondary-vertex detectors. Actually the first published measurement used a primitive secondary-vertex detector built by Walter Innes and myself to improve the triggering efficiency of the Mark II detector.[55] Led by G.J. Feldman and G.H. Trilling we measured $\tau_\tau = (4.6 \pm 1.9) \times 10^{-13}$ sec.

Another early measurement was from the MAC experiment at PEP with $\tau_\tau = (4.9 \pm 2.0) \times 10^{-13}$ sec.[56]

The modern era in τ lifetime measurements began with the pioneering work of John Jaros on precision vertex detectors.[57] Table IV taken from his paper[57] shows the status of τ lifetime measurements at the end of 1982. Theory predicts

$$\tau_\tau = \tau_\mu \left(\frac{m_\mu}{m_\tau}\right)^5 B(\tau^- \to \nu_\tau e^- \bar{\nu}_e) \ , \qquad (11a)$$