where N is the total number of electrons, and A is the asymmetry, in the given data sample. For a fixed magnetic field and muon momentum, the statistical figure of merit is NA^2, the quantity to be maximized in order to minimize the statistical uncertainty.

The energy dependencies of the numbers and asymmetries used in Equations 3.17 and 3.18, along with the figures of merit NA^2, are plotted in Figures 3.6 and 3.7 for the case of E821. The statistical power is greatest for electrons at 2.6 GeV (Figure 3.6). When a fit is made to all electrons above a single energy threshold, the optimal threshold energy is about 1.7-1.8 GeV (Figure 3.7).

The resulting arrival-time spectrum of electrons with energy greater than 1.8 GeV from the final E821 data run is shown in Fig. 3.8. While this plot clearly exhibits the expected features of the five-parameter function, a least-square fit to these 3.6 billion events gives an unacceptably large chi-square. A number of small effects must be taken into account to obtain a reasonable fit, which will be discussed in Chapter 5.

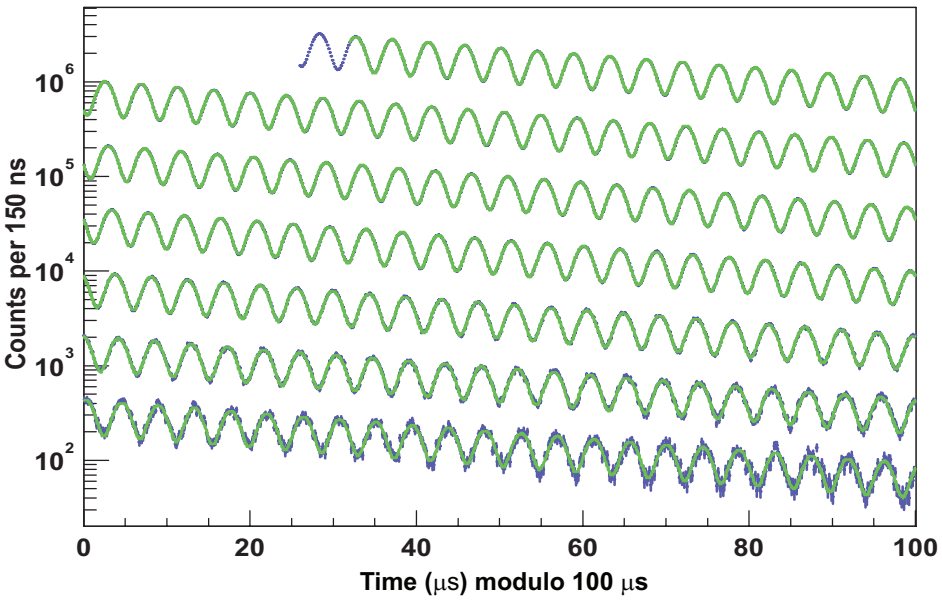

Figure 3.8: Histogram, modulo 100 μ s, of the number of detected electrons above 1.8 GeV for the 2001 data set as a function of time, summed over detectors, with a least-squares fit to the spectrum superimposed. Total number of electrons is 3.6×10^9. The data are in blue, the fit in green.