Chapter 10

Comments and Reflections

The results we have presented in this dissertation represent improvements in each case over similar measurements made by our predecessor experiment E760, and those reported by other experiments. The small $\chi_2 \to \gamma\gamma$ partial width has been confirmed, and the larger η_c total width measured by E760 is also supported by our investigation. In the framework of pQCD, we have determined a value of $\alpha_{\rm s}(m_c)$ which is compatible with other measurements, and has small experimental error.

Our work has also left some troubling unanswered questions. For instance, where is η_c'? Do we have a chance to see it at all, in $\bar{p}p \to \eta_c' \to \gamma\gamma$? Is it anomalously narrow for some reason? Is its coupling to $\bar{p}p$ unexpectedly small? More interestingly, is its $\gamma\gamma$ decay greatly suppressed, as recent evidence from DELPHI suggests might be the case?

E835′, the next run of this succesful family of experiments, is set to run in the fall of 1999. Perhaps this run will finally answer some of these and other questions.

An investigation of χ_0 is planned, the very interesting ratio $\Gamma(\chi_0{\rightarrow}\gamma\gamma)/\Gamma(\chi_2{\rightarrow}\gamma\gamma)$ should be measured with good precision. The indications from E835 of a large $\bar{p}p{\rightarrow}\chi_0$ width [78] needs to be confirmed. The identification of the $^1P_1$ state will be confirmed, and its width and decay modes will be investigated.