LBL-31752a
ESG-165

Abstract for an Invited Paper
for the Washington Meeting of the
American Physical Society
20–24 April, 1992

Beam-Beam Effects in Asymmetric Colliders*

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Several institutions have recently proposed high-luminosity, asymmetric, e^+-e^- colliders whose primary purpose is the detailed study of the B meson system. Typically the design of these "B factories" is optimized for a CMS energy in the neighborhood of 10.6 GeV, corresponding to the $\Upsilon(4S)$ resonance, and for a luminosity $\mathscr{L}$ = (a few) $\times 10^{33}$ cm^{-2} s^{-1}. A novel feature in the design of these colliders is the difference in the beam energies, which causes a motion of the CMS in the laboratory; this motion is intended to enhance the detection efficiency of certain decay modes that are of particular interest for the study of CP violation. The energy asymmetry requires that the bunches travel in separate vacuum chambers under the influence of separate magnetic fields; this feature leads to a parameter space of twice the dimensionality of that for a conventional (single-vacuum-chamber) e^+-e^- collider. The relatively high luminosity, along with other practical constraints, requires a large number of bunches; this leads, in turn, to a bunch spacing that is typically much shorter than in conventional colliders, entailing the potential for undesireable glancing collisions in the vicinity of the interaction point. In this talk we briefly compare generic similarities and differences among several proposed designs from the perspective of beam-beam dynamics, and we also present some detailed simulation results for the proposed SLAC/LBL/LLNL B factory.

* Work supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, High Energy Division, of the U.S. Department of Energy under Contract no. DE-AC03-76SF00098.