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PETAVAC: 100 TeV PROTON-ANTIPROTON COLLIDER IN SSC TUNNEL

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Recent developments in accelerator physics and super-conducting magnet technology make it reasonable to extend proton-antiproton colliding beams from the 2 TeV of the Tevatron to 100 TeV in the existing SSC tunnel, with luminosity ˜10ˆ35 /cm2s. At 100 TeV boson-boson fusion becomes a significant initial state for production of new massive particles. Petavac would extend the mass reach beyond LHC by the same factor that LHC extends beyond Tevatron. The major parameters and design issues will be discussed.

Summary

The antiproton source and collider scenarios at the Tevatron yield accumulation of >2 x 1011 /hr, cooling and stacking of >2 x 1012 in 10 hr. Control of emittance growth mechanisms yields collisions with luminosity >2 x 1032 cm-2s-1 in each store and luminosity lifetime >10 hr. Nb3Sn dipole development has yielded field strength >16 T, and 4-m-long coils using this technology have been tested successfully. We present a conceptual for a 100 TeV collider in which a single 16 T magnet ring is located in the SSC tunnel, and discuss issues from synchrotron radiation, electron cloud effect, and beam separation.
Here we examine the case for a collider of 100 TeV energy and 1035 cm-2s-1 luminosity: the technology for a 16.5 T magnet ring, control of synchrotron light emitted by the beams, the elimination of subsidiary bunch cross-ings, the luminosity scaled from Tevatron performance, the SSC tunnel in Waxahatchie, and the physics potential of hadron collisions at 100 TeV.

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