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100 TeV Proton-Antiproton Collider in the SSC Tunnel[1]

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Two developments over the past decade have made it possible to design a high-luminosity 100 TeV hadron collider in the SSC tunnel in Texas. First, superconducting magnet technology has matured so that it is now feasible to build 16 Tesla Nb_3Sn dipoles and 450 T/m quadrupoles for a collider lattice. Second, Fermilab has advanced the state of art of antiproton sources so that it is possible to accumulate the antiprotons needed to sustain a luminosity of $\sim 10^{35} cm^{-2} s^{-1}$ and techniques to sustain the luminosity during a store. Synchrotron damping of the beams has a time constant of $\sim$15 minutes, providing stability against mechanisms of slow emittance growth. The proposed single-ring collider would open a new era for high energy physics, after the LHC era that is about to begin, in which weak boson fusion would dominate as a pathway to new particle production. It would extend the reach for discovery beyond LHC by the same factor that LHC will extend beyond Tevatron.

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