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Upgrading Luminosity from the Tevatron Through the LHC

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Very soon the LHC will push the high energy frontier from 1 TeV to 7 TeV, well beyond present operating experience with the Tevatron. The LHC (with 2 rings) is also expected to raise proton luminosities by about two orders of magnitude, to about $10^{34} \text{ cm}^{-2}\text{sec}^{-1}$ in its initial configuration. This extrapolation leads to a new regime of Accelerator Physics and Technology challenges. The stored energy in the nominal LHC beam is almost 3 orders of magnitude larger than in the Tevatron. Efficient acceleration up the energy ramp is more difficult and more important. Long range beam-beam collisions become more severe. Luminosity debris power becomes a significant constraint. The U.S. LHC Accelerator Research Program (LARP) is a collaboration of BNL, FNAL, LBNL, and SLAC, working with CERN to address these frontier issues. LARP is also working with CERN on an LHC Interaction Region upgrade, through which the luminosity may be increased even further, to about $10^{35}\text{cm}^{-2}\text{sec}^{-1}$. This paper discusses the technical issues in extrapolating the energy and luminosity from the Tevatron to the LHC, and describes the programs in place to address them.