Physics 7661: Collider Physics

This is the official web page of Physics 7661, a graduate-level course on Collider Physics, taught by Maxim Perelstein at Cornell in the Fall semester of 2009. For more information about the course, see the poster.

Announcements

- **First Lecture:** Thursday August 27, 2:55-4:25 pm EST, Newman Lab 311.
- **Video Connection Information:** Remote participation will be available via EVO. Instructions for remote users are available [here](#).
- **MadGraph/MadEvent Tutorial:** In lecture 2 (09/01), we will have a tutorial-style introduction to MG/ME, a tool for automatic calculation of matrix elements and Monte Carlo simulations of high-energy particle collisions. If you want to follow the tutorial, please bring your laptop to lecture. If you never used this tool before, please register on the MG web site before the lecture. (You do not need to download the code.)

Lectures

- L1 [08/27]: notes and slides

Problem Sets

- Coming soon ...

Online Resources

- MadGraph/MadEvent Tutorial
- PYTHIA web site
- PGS - Pretty Good Simulation
- Parton Distribution Generator at Durham
- Recommended Textbooks
  - Peskin and Schroeder, "An Introduction to Quantum Field Theory" (book web page)
  - Barger and Philips, "Collider Physics"
  - Ellis, Stirling and Webber, "QCD and Collider Physics"
  - Green, "High Pt Physics at Hadron Colliders"

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<tr>
<th>Name</th>
<th>Type</th>
<th>$\sqrt{s}$ (GeV)</th>
<th>$L_{\text{int}}$ (pb$^{-1}$)</th>
<th>Years of operation</th>
<th>Detectors</th>
<th>Location</th>
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<tbody>
<tr>
<td>LEP</td>
<td>$e^+e^-$</td>
<td>91.2 (LEP-1)</td>
<td>$\approx 200$ (LEP-1)</td>
<td>1989-95 (LEP-1)</td>
<td>ALEPH, L3,</td>
<td>CERN</td>
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<td></td>
<td>161-209 (LEP-2)</td>
<td>$\approx 600$ (LEP-2)</td>
<td>1996-2000 (LEP-2)</td>
<td>DELPHI, OPAL</td>
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<tr>
<td></td>
<td></td>
<td>91.2</td>
<td>20</td>
<td>1992-98</td>
<td>SLD</td>
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<tr>
<td>SLC</td>
<td>$e^+e^-$</td>
<td>320</td>
<td>500</td>
<td>1992-2007</td>
<td>ZEUS, H1</td>
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<td>HERA</td>
<td>$e^\pm p$</td>
<td>1800 (Run-1)</td>
<td>160 (Run-1)</td>
<td>1987-96 (Run-1)</td>
<td>CDF, DØ</td>
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<td></td>
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<td>1960 (Run-2)</td>
<td>6 K (Run-2, 06/09)</td>
<td>2000-?? (Run-2)</td>
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<tr>
<td>Tevatron</td>
<td>$p\bar{p}$</td>
<td>14000</td>
<td>$\approx 50$?</td>
<td>2010? - 2013?</td>
<td>ATLAS, CMS</td>
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<td>LHC (design)</td>
<td>$p\bar{p}$</td>
<td>7000</td>
<td>1 M??</td>
<td>2013? - 2016??</td>
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<td>LHC-2009</td>
<td>$e^+e^-$</td>
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<td>11/09- 05/10?</td>
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<td>ILC</td>
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Table 1: Recent and future energy-frontier particle colliders.
Fig. 2. Measured cross sections of muon-pair production compared with the fit results. The ALEPH measurements below 60 GeV correspond to the exclusive hard ISR selection that are not used in the fit. For comparison the measurements at lower energies from PEP, PETRA and TRISTAN are included.

Fig. 3. Measured forward-backward asymmetries of muon-pair production compared with the fit results. The ALEPH measurements below 60 GeV correspond to the exclusive hard ISR selection that are not used in the fit. For comparison the measurements at lower energies from PEP, PETRA and TRISTAN are included.

ATLAS, PLB 399, 329 (1997)