PATRIOT

Physics
Archives &
Tools
Required to
Investigate
Our
Theories

Stephen Mrenna

Motivation

- Experiments rely on Monte Carlo programs
  - Transform theory calculations into experimental observables
  - Workhorses that impact all stages of an experiment (conception to design to analysis to publications)
- Many different theoretical calculations
  - Lowest Order, Next-to-Leading-Order, "All" Orders
    - Different Levels of Accuracy
    - Different Areas of Applicability
    - Subtle Overlap
  - Theory expertise is essential to make sense of it all

Theoretical and Computational Problem

- Many programs
  - CompHEP / Madgraph / AlpGen / Gr@ppa / …
  - MCFM / DYRad / JetRad / …
  - Pythia / Herwig / Isajet
- Need a common and systematic comparison
  - Is the computation valid?
  - Is the physics valid?
  - When and where should each be used?
  - What is the systematic uncertainty?

Other Motivations

- Want a Lookup Table for Standard processes
- Quantify anomalies
  - *Initial new physics effects may be subtle*
    - Can appear as tails to SM kinematic distributions
  - Difficult to determine the probability for a rare event *after the fact*
- Signature-based search for new physics
  - Look for correlations in many SM channels
- Lots of work to generate such samples (correctly)
  - *Many people interested in same thing*

An Important Topic!

- Uncertainties in how events should be generated are significant or most important errors for:
  - Top mass determination
  - Precision W-mass extraction
    - 40 MeV vs 65-100 MeV (stat)
    - Together, a window to new physics
  - NLO jet predictions with k_T-algorithm vs. Cone
  - …
- Ignorance limits what we can learn about Nature

What is Patriot?

- Large (1 TB) database
- Systematic generation of interesting Standard Model predictions
  - Events written to Enstore tapes
    - Common STDHEP format + extra information
  - Several different generators
    - Different levels of generation
      - Parton
      - Showered partons
      - Particle level
- Documentation
- Examples to regenerate events

Where is Patriot?

- Mount point /pnfs/patriot
  - Viewable on:
    - CD cluster
    - Theory cluster
    - FNALU
    - 2 CDF machines
    - 2 DØ machines
  - Available to experimentalists and theorists

MC events Data Base for Run II

- http://www-d0.fnal.gov/~dudko/mcdb/

Netscape: MC events Data Base for the Tevatron Run II

File Edit View Go Communicator Help

Members WebMail Connections BizJournal SmartUpdate Mktplace

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: http://www-d0.fnal.gov/~dudko/mcdb/ What's Related

W n jets
Z n jets
Top
Gamma n jets
WW n jets
PROGRAMS
Generated Samples and Requests
ZZ n jets
Higgs
WZ n jets
FAQ
W n Gamma n jets

search

News

- CompHEP p,P->W, b, b -> e, nu, b, b events
- CompHEP p,P->t, b -> e, nu, b, b events
- CompHEP p,P->Z, b, b -> e , e-, b, b events
- W-Gamma production
- Generated Datasets and Requests
- Ttbar dilepton events in pbarp at 1.96 TeV
- CompHEP with batch interface

Documents

Ttbar dilepton events in pbarp at 1.96 TeV
ppbar to e nu b e nu b; full matrix element calculation in COMPHEP.
published: 20.03.2002 | author: E. Boos, H. Frisch | category: Top .:

W-Gamma production
W-Gamma -> e (e-), neutrino, gamma events
published: 15.03.2002 | author: Alexander Belyaev | category: W n Gamma n jets .:

CompHEP p,P->t, b -> e, nu, b, b events
CompHEP MC events for 2->4 process of tb production
published: 15.03.2002 | author: Lev Dudko | category: Top .:

CompHEP p,P->Z, b, b -> e , e-, b, b events
Description of created Zbb MC events.
published: 12.03.2002 | author: Lev Dudko | category: Z n jets .:

CompHEP p,P->W, b, b -> e, nu, b, b events
Description of created Wbb MC events.
published: 11.03.2002 | author: Lev Dudko | category: W n jets .:

CompHEP with batch interface
This is the standard version of CompHEP with new script which run numerical calculations in batch mode
published: 06.03.2002 | author: Lev Dudko | category: PROGRAMS .:

Generated Datasets and Requests
The list of datasets that have been generated, or have been requested and are waiting to be generated.
published: 06.03.2002 | author: MC group | category: Generated Samples and Requests .:

Input/Output Test with StdHEPv5_01 using MCFIO
Example of using Pythia, StdHEP and MCFIO to generate events and save them in a compressed format.
published: 05.03.2002 | author: Stephen Mrenna | category: PROGRAMS .:

CompHEP-PYTHIA interface with the option to create STDHEP events
CompHEP-PYTHIA interface was updated to create output files in STDHEP format. Version of the interface: CPYTH62 for PYTHIA62
published: 03.03.2002 | author: Alexander Belyaev | category: PROGRAMS .:

Single top: p,pbar->tqb (2-5 matrix elements)
CompHEP MC events for the p,pbar->t,j,b -> W,b,j,b -> l,nu,b,j,b process, where j=u,U,d,D,s,S,c,C,G
published: 02.03.2002 | author: Lev Dudko | category: Top .:

Pages: 1 2

Sanitarium WebLoG

Generated Data Sets/Requests

Netscape: Generated Datasets and Requests

File Edit View Go Communicator Help

Members WebMail Connections BizJournal SmartUpdate Mp3.com

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: http://www-d0.fnal.gov/~dudko/mcdb/7/18_1.html What's Related

W n jets
Z n jets
Top
Gamma n jets
WW n jets
PROGRAMS
Generated Samples and Requests
ZZ n jets
Higgs
WZ n jets
FAQ
W n Gamma n jets

Generated Datasets and Requests

Author: MC group (Lev V. Dudko , Stephen Mrenna ,Henry J. Frisch ,Sebastian Carron Montero , Alexander Belyaev , Eduard Boos)
Published Data: 06.03.2002
Category: Generated Samples and Requests
Print version

Process	X sec.	Events number	validation
p,P->t,tbar->b,bbar 4f	6pb	...	...
p,P->t,tbar->b,bbar qq qq	6pb	...	...
p,P->t,tbar->b,bbar qq l nu	6pb	...	...
p,P-> t,tbar->b,bbar l nu l nu	0.075 pb	600k	Ttbar dilepton events in pbarp at 1.96 TeV
p,P->tqb->e,nu,b,q,b	0.11 pb	400k	Single top: p,pbar->tqb (2-5 matrix elements)
p,P->tb->e,nu,b,b			CompHEP p,P->t, b -> e, nu, b, b events
p,P->W->e,nu			in preparation(Sebastian C.).
p,P->W,j			ready
p,P->Wc->e,nu,c			requested
p,P->W b ->e,nu,b			requested
p,P->Wjj->e,nu,j,j	217 pb	600k	CompHEP Wjj events (2->4 matrix elements)
p,P->Wbb->e,nu,b, b	1.55 pb	600k	CompHEP p,P->W, b, b -> e, nu, b, b events
p,P->W,3j			in preparation (L.Dudko)
p,P->W, 4j			in preparation (A.Belyaev)
p,P->Z/A->e,e			in preparation(Sebastian C.)
p,P->Z/A->nu,nu			in preparation(Sebastian C.)
p,P->Z/A j->e,e, j			in preparation (A.Belyaev)
p,P->Z/A j->nu,nu, j			in preparation (A.Belyaev)
p,P->Zjj->e,e,j,j	26.1 pb	250k	CompHEP Zjj events (2->4 and 2->3 matrix elements)
p,P->Zbb->e,e,b, b	0.39 pb	300k	**CompHEP p,P->Z, b, b -> e , e-, b, b events**
p,P->Z,3j	..	...	in preparation (L.Dudko)
p,P->W,A->e,nu,A	..	250k	CompHEP W-Gamma events (2->3 matrix elements)
p,P->Z,A->e,e,A	..	..	in preparation (Sebastian C.)
p,P->Z,A->nu,nu,A	..	..	in preparation
p,P->W,A,A->e,nu, A, A			in preparation(Sebastian C.)
p,P->W,W->e,nu, j, j			
p,P->Z,Z->e,e,j,j			
p,P->W,Z->e,nu, j, j			
p,P->W,Z->e,nu, e, e			

100%

CompHEP Single Top Events

Netscape: CompHEP p,P->t, b -> e, nu, b, b events

File Edit View Go Communicator Help

Members WebMail Connection Bookmarks Location: http://www-d0.fnal.gov/%7Edudko/mcdb/3/31_1.html What's Related

Back Forward Reload Home Search Netscape Print Security Shop Stop

- W n jets
- Z n jets
- Top
- Gamma n jets
- WW n jets
- PROGRAMS
- Generated Samples and Requests
- ZZ n jets
- Higgs
- WZ n jets
- FAQ
- W n Gamma n jets

CompHEP p,P->t, b -> e, nu, b, b events

Author: Lev Dudko (dudko@fnal.gov)
Published Data: 15.03.2002
Category: Top
Print version

There are the MC events for the process
p,P->t, b -> e, nu, b, b
generated by CompHEP 41.10 with correct angular distributions
for the final state particles. The contribution of the sea quarks in the initial
state has been included, due to use the u#,d# model (described in hep-ph/0004194).

The subprocesses are included as follow:

PROCESS u# D# -> E1 n1 b B Cross_section 3.166233E-02
PROCESS U# d# -> e1 N1 b B Cross_section 7.328928E-04
PROCESS d# U# -> e1 N1 b B Cross_section 3.163508E-02
PROCESS D# u# -> E1 n1 b B Cross_section 7.336317E-04
Number_of_subprocesses = 4
Total_cross_section_(pb) = 6.476393E-02
Events_mixed_and_randomized = 408988

Parameters of generation:

SQRT(S) 1.960000E 03 GeV
StrFun1: PDF:CTEQ5L(proton)
StrFun2: PDF:CTEQ5L(anti-proton)
QCD scale Q = 175 GeV
Such choice of the scale is based on the paper
hep-ph/9604223

Cuts:
Pt(b1) > 10 GeV
Pt(b2) > 10 GeV
DeltaR(b1,b2) > 0.5

These events and generator are available in enstore system
(e.g. fsgi03.fnal.gov): /pnfs/patriot/Top/tb/

31Kb diagrams.ps - Feynman diagrams
3.6Kb diagrams.tex
1.8Kb prt_1 - protocols of the calculations
1.8Kb prt_2
1.8Kb prt_3
1.8Kb prt_4
110Mb tb_2-4_enbb.pev - mixed and randomized events in native format
for the CompHEP-Pythia interface
233Kb res_tb.tar.gz - generator of MC events. There are c-code of the diagrams, one can compile
it with CompHEP libs ($COMPHEP/lnCompil ;$COMPHEP/ld_n).
Precompiled generator for the linux.
batch.dat file to run in batch mode.

If you use these events, please refere to:
CompHEP
\bibitem{comphep}
"COMPHEP: A PACKAGE FOR EVALUATION OF FEYNMAN DIAGRAMS AND INTEGRATION
OVER MULTIPARTICLE PHASE SPACE."
By A.~Pukhov, E.~Boos, M.~Dubinin, V.~Edneral, V.~Ilyin, D.~Kovalenko, A.~Kryukov,
V.~Savrin (Moscow State U.), S.~Shichanin (Serpukhov, IHEP),
A.~Semenov (Dubna, JINR). INP-MSU-98-41-542, Aug 1999. 126pp.
User's manual for version 33. e-Print Archive: hep-ph/9908288;
E.E.~Boos, M.N.~Dubinin, V.A.~Ilyin, A.E.~Pukhov,
and V.I.~Savrin, INP MSU 94-36/358 and SNUTP-94-116, hep-ph/9503280;
P.~Baikov \textit{et al.}, in Proc. of the XIth Int. Workshop on High

Patriot Overview

- **Physics**
  - Different methods of calculating HEP observables
    - Need to understand/test/compare them
- **Archives**
  - Database of Monte Carlo predictions
    - Checks/Investigating Rare Events/Searches
- **Tools**
  - Benchmarks for further event generation
- **Required to Investigate Our Theories**
  - An integral part of exploiting Run II
- Starting point for much more additional work
  - Validation, Tuning, Generator Improvements