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Proposal for an MCnet “living resource”

Michael H Seymour

13th MCnet meeting

Göttingen April 4th – 6th 2016

MCnet RTN (2007–2010)



2.6.1 Milestones

Year 4: Completion of a systematic review of the results of the network's event generators after tuning, their commonalities and differences and detailed comparison with the early LHC data. Submission for publication in a peer-reviewed journal.

MCnet RTN (2007–2010)



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Physics Reports 504 (2011) 145–233



Contents lists available at ScienceDirect

Physics Reports

journal homepage: www.elsevier.com/locate/physrep



General-purpose event generators for LHC physics

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MCnet RTN (2007–2010)



- 15 authors, \leq 1 month each
- + dedicated 3-day meeting for final editing

MCnetITN (2013–2016)



B.4.4.2 Deliverables

- a web-based ‘living review’ of Monte Carlo physics and event generator results.

As part of our previous network, we wrote an extensive review of event generator physics. We will extend this further by producing an interactive and ‘living’ resource in which the physics points are demonstrated by online applications, for example with the possibility to make distributions using various modified parton shower algorithms, and in which comparison plots are automatically updated as new data sets, new event generator versions, or even new event generators, are released. This activity will naturally involve all our projects.

MCnetITN (2013–2016)



MCplots

mcplots.cern.ch

Menu

- Front Page
- LHC@home / Test4Theory
- Generator Versions
- Generator Validation
- Tuning Validation
- Update History
- User Manual and Reference

Analysis filter:

→ Beam: **pp/ppbar** ee

→ Analysis:

Z (Drell-Yan)

- $1/\sigma d\sigma(Z)/d\phi^*_\eta$
- $d\sigma(Z)/dp_{TZ}$
- $1/\sigma d\sigma(Z)/dp_{TZ}$

W

- Charge asymmetry vs η
- $d\sigma(\text{jet})/dp_T$
- Jet multiplicity

mcplots.cern.ch

December 2015 - [P. Skands](#), I. Charalimpidis, A. Karneyeu, D. Konstantinov, M. Mangano, L. Mijovic, S. Prestel

Reference: Eur Phys J C74 (2014) 1 ([arXiv:1306.3436](#))

New! donate your unused CPU cycles to mcplots, via the [Test4Theory project](#) (based on [LHC@home](#)).

← Select beam, process, and observable

Navigate these pages by using the menu to the left. The default for each topic is a comparison of a small number of models to available data, but look for links at the top of each page for comparisons with more tunes/generators. Scroll down each page to see plots at other collider energies. To choose specific generator version(s), use the [Generator Versions](#) link towards the top of the menu (the default is to just display the most recent ones). More plots will be added, as new tunes become available, and as the available data increases.

Note: For a description in layman's terms, and/or to find out how to donate your unused CPU cycles to help generate more statistics for mcplots see the [Test4Theory project](#), the first volunteer cloud computing project to be based on [Virtual Machines](#) via the [LHC@home](#) platform.

MCPLOTS

MCPLOTS is intended as a simple browsable repository of MC (Monte Carlo) plots comparing High Energy

Go to "http://lhcbhome.web.cern.ch/projects/test4theory"

MCnetITN (2013–2016)



MCplots
Reader
+

mcplots.cern.ch/?query=plots,ppppbar,winclusive,njets
Daily Mass Readings UK
Apple
Amazon
eBay
Yahoo!
MEP maths
Tutorial database
Kiran Ostrolenk
The ALAN TU...ition 2016

→ Update History

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W

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→ $d\sigma(\text{jet})/dpT$

→ **Jet multiplicity**

Top (MC only)

→ $\Delta\phi$ (ttbar)

→ Δy (ttbar)

→ $|\Delta y|$ (ttbar)

→ M (ttbar)

→ pT (ttbar)

→ Cross sections

→ y (ttbar)

→ Asymmetry

→ Individual tops

pp @ 7000 GeV

ATLAS (electron channel)

ATLAS_2010_S8919674
Herwig++ 2.7.1, Pythia 6.428, Pythia 8.212, Sherpa 2.1.1

ATLAS (muon channel)

ATLAS_2010_S8919674
Herwig++ 2.7.1, Pythia 6.428, Pythia 8.212, Sherpa 2.1.1

Ratio to ATLAS

Ratio to ATLAS

MCnetITN (2013–2016)



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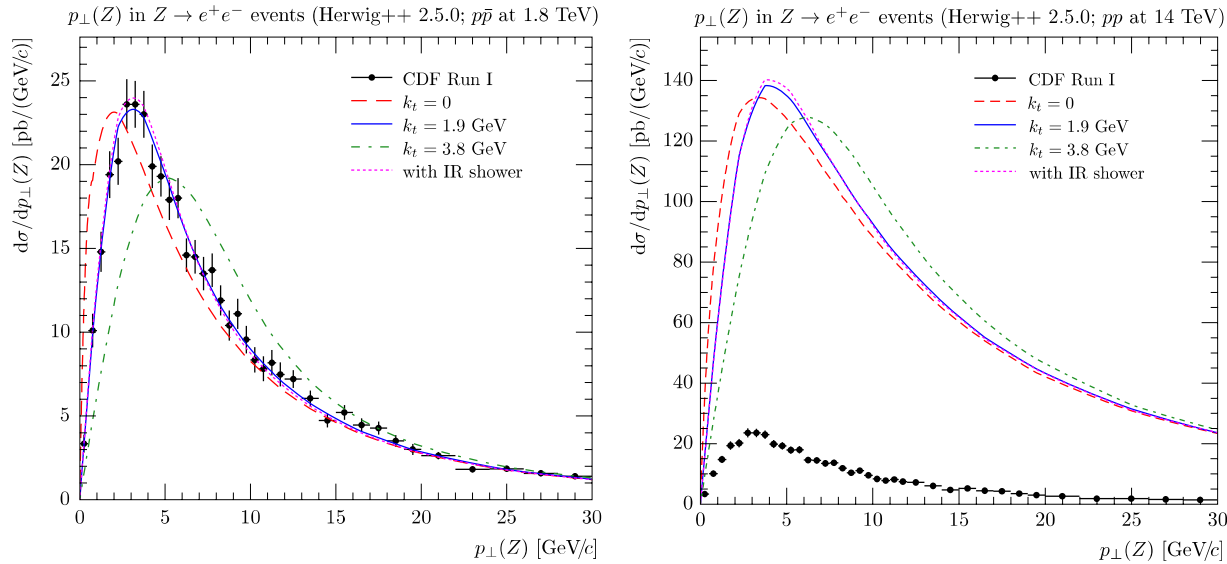


Fig. 7. The low- p_{\perp} peak of the p_{\perp} distribution of lepton pairs in Drell–Yan events at the Tevatron, compared to CDF data [96]. A Monte Carlo model (Herwig++) is shown with four different choices for the “primordial k_{\perp} ”. (a) $p\bar{p}$ at 1.8 TeV (b) pp at 14 TeV.

models, the expectation is that this should generate a more realistic process and collision energy dependence of the effective primordial k_{\perp} .

A secondary modelling issue, relevant to the MPI models discussed in the next subsection, is how much primordial k_{\perp} is assigned to partons initiating multiple-parton interactions, and how the associated recoil effects are distributed among those initiators and the remnant. Typically, MPI initiators are only assigned a primordial k_{\perp} of the order of Fermi motion, although this is a model-dependent statement that may of course change, as models improve.

Empirically, the most important distribution for constraining the magnitude of this effect is the p_{\perp} distribution of lepton pairs in Drell–Yan events. The peak of this distribution is extremely sensitive to infrared effects. In Fig. 7(a), we compare the distribution measured by the CDF experiment [96] to a Monte Carlo model (Herwig++) with four different primordial- k_{\perp} settings: 0 GeV (off), 1.9 GeV (the default in Herwig++), 3.8 GeV (twice the default), and the IR-augmented shower model [95]. To illustrate how these predictions scale with collider centre-of-mass energy, keeping the Q^2 of the hard interaction fixed, we also include a plot showing the p_{\perp} of Drell–Yan pairs in pp collisions at 14 TeV in Fig. 7(b); the distributions becomes broader, but the peak position stays relatively constant. A comparison of different generators on this distribution can be found in Fig. 18 in the comparisons section of the review (Section 18).

MCnetITN (2013–2016)



- Can we reuse text of review with “live” figures provided by MCPLOTS ?
 - constantly updated with latest version and default parameters
 - configurable by reader for non-standard settings/parameters
 - cached for future readers
- Who can do this?
- Do we need a dedicated meeting?
 - If so, we have resources to fund it, but where and when?

MCnetITN3 (2017–2020)?

2.3.1 Dissemination of the research results

The interactive tutorials of our Annual Schools can also be seen as part of our dissemination strategy, which have a significant impact on the students at the school and, through them, their research groups. In the new network, we will develop this further to have a much wider and more lasting impact on the whole community, by **restructuring our tutorials into interactive online courses, dynamically linked with the online review**. This will enable any PhD student in High Energy Physics and related subjects around the world to quickly get started using our generators, and learn the underlying physics. Thus we will leave a legacy not only of our research output but also our training output.

