

HERAFitter Users Meeting

28.05.2013



Today's agenda:

Tuesday, 28 May 2013

- | | | |
|---------------|---|---|
| 15:00 - 15:20 | Status 20' | ▼ |
| | Speakers: Ringaile Placakyte (Deutsches Elektronen-Synchrotron (DE)), Voica Ana Maria Radescu (Deutsches Elektronen-Synchrotron (DE)) | |
| 15:20 - 15:40 | QCDNUM update 20' | ▼ |
| | Speaker: Michiel Botje (NIKHEF (NL)) | |
| 15:40 - 16:00 | ACOT and NF transitions 20' | ▼ |
| | Speakers: Fred Olness (Southern Methodist University (US)), Dr. Aleksander Kusina (Southern Methodist University) | |
| 16:00 - 16:20 | ttbar and running mass 20' | ▼ |
| | Speaker: Marco Guzzi | |
| 16:20 - 16:40 | Discussion 20' | ▼ |
| | Speaker: All | |

LHCP (May 2013):

EPS (July 2013):

Low X (June 2013):

HADRONSTRUCTURE13 (July 2013):

QCD@LHC (September 2013):

ISMD (September):

Charm2013:

we had a poster

dedicated talk

dedicated talk

dedicated talk

dedicated talk

abstract submitted

we should sent an abstract

The screenshot shows the HERAFitter Wiki page. On the left, there are navigation menus for Wiki (WikiPolicy, RecentChanges, FindPage, HelpContents, HERAFitter) and Page (Edit (Text), Edit (GUI), Info, Subscribe, Add Link, Attachments, More Actions). The main content area has a 'Welcome to HERAFitter' section, followed by a paragraph about PDFs, a 'Downloads of HERAFitter software package' section with a new release notice, and a 'HERAFitter Meetings' section. The 'HERAFitter Meetings' section lists three types of meetings: User's Meetings, Developer's Meeting, and Steering Group's Meeting. Below this is a 'HERAFitter representation' section with a red circle around the 'List of results under construction' and 'List of collected talks' links. A red arrow points from the text '← store/share information about meetings' to these links. Further down are sections for 'Developers Info (restricted to developers)' and 'Organisation' with a list of roles and names.

Wiki
 WikiPolicy
 RecentChanges
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HERAFitter

Welcome to HERAFitter

The proton parton distribution functions (PDFs) are essential for precision physics at the LHC and other hadron colliders. The determination of the PDFs is a complex endeavor involving several physics processes. The main process is the lepton proton deep-inelastic scattering (DIS), with data collected by the HERA ep collider covering a large kinematic phase space needed to extract PDFs. Further processes (fixed target DIS, ppbar collisions etc.) provide additional constraining powers for flavour separation. In particular the precise measurements obtained or to come from LHC will continue to improve the knowledge of the PDF.

HERAFitter project is an open source QCD fit framework ready to extract PDFs and assess the impact of new data which we would like to present here. The framework includes modules allowing for a various theoretical and methodological options, capable to fit a large number of relevant data sets from HERA, Tevatron and LHC. This framework is already used in many analyses at the LHC.

Downloads of HERAFitter software package

New HERAFitter release is publicly available. The HERAFitter releases can be accessed [HERE](#).

HERAFitter Meetings

- **User's Meetings:** monthly meetings to enhance communication between users and developers (open access)
- **Developer's Meeting:** technical weekly meetings to ensure communication among developers (restricted access)
- **Steering Group's Meeting** (restricted access)

HERAFitter representation

- [List of results under construction](#)
- [List of collected talks](#)

← store/share information about meetings

Developers Info (restricted to developers)

- Internal Developments

Organisation

- **Conveners:** Voica Radescu, Ringaile Placakyte, Amanda Cooper-Sarkar
- **Release coordinator:** Sasha Glazov
- **Contact Persons:** Cristi Diaconu (H1), Klaus Rabbertz (CMS), Bogdan Malaescu (ATLAS), Olaf Behnke (ZEUS), Ronan McNulty (LHCb), Gavin Salam (theory)
- **Steering Group:** Voica Radescu, Ringaile Placakyte, Sasha Glazov, Amanda Cooper-Sarkar, Gavin Salam (theory), Klaus Rabbertz (CMS), Bogdan Malaescu (ATLAS), Ronan McNulty (LHCb), Olaf Behnke (ZEUS), Cristi Diaconu (H1, chair)
- **Librarians:** authors/developers of individual modules
- **Getting help:** Send email to herafitter-help@desy.de



- DIS processes using several schemes of heavy quark treatment
 - RT as used by MSTW
 - ACOT as used by CTEQ
 - FFNS as used by ABM
- Electroweak corrections for ep scattering
- Drell-Yan processes using K-factors, APPLGRID interface to MCFM (NLO) or FastNLO
- Top pair production in pp collisions up to approximate NNLO accuracy using HATHOR package
- Dipole models providing an alternative approach to DIS process at low x region
- Jet production cross sections are calculated via FastNLO or APPLGRID packages at NLO
- Unintegrated PDFs based on CASCADE (for NC ep scattering only)
- Diffractive PDFs

- LHC W Production**
- Tevatron Top Production**
- HERA Inclusive DIS**
- Tevatron Inclusive Jets**
- LHC Z Production**
- HERA Diffractive DIS**

HERAFitter
Evolution based on QCDNUM
Minimization based on MINUIT

- Several representations of χ^2 function accounting for correlations:
 - Using nuisance parameters
 - Using full covariance matrix, accounting also for statistical correlation
- Various types of data uncertainty treatment
 - Hessian, Monte Carlo and Offset
- Data driven regularisation (as applied by NNPDF group) based on splitting data randomly into fit (for PDF determination) and control (to protect against over-fitting) samples
- External regularisation based on a penalty term in χ^2 using regularisation parameter T
- Bayesian reweighting technique to check impact of new data on an existing PDF set
 - applies weights to PDF probability distribution used as input, based on how well new data is described
 - outputs an updated PDF

- Parton Density Functions**
 $\alpha_s, M_Z, m_c, m_b, m_s, f_{1,2}$
Theoretical predictions
- PDF determination from final H1 inclusive data**
JHEP 09 (2012) 061
- LHeC impact studies**
J.Phys. G39 (2012) 075001
- Determination of the strange quark density from ATLAS W/Z measurements**
Phys.Rev.Lett. 109 (2012) 012001
- HERA charm production measurement**
Eur.Phys.J. C73(2012), 2311
- Measurement of inclusive jet cross sections at 2.76 and 7 TeV by ATLAS**
ATLAS-CONF-2012
- Ongoing CMS analyses of inclusive jet and Drell-Yan data are using HERAFitter

Recommendations of the 75.PRC

24 May 2013

HERAFitter

The PRC congratulates the HERAFitter group on the large achievements that were made. The committee is pleased to see that several new functionalities have been implemented in the recent version that makes HERAFitter to a versatile analysis tool and QCD analysis framework with rapidly increasing usage at the LHC experiments and dedicated fit forums within the ATLAS and CMS collaborations steered by DESY physicists. The DESY IT administration assures a solid infrastructure for maintenance and further evolution of the project and is encouraged to allow developers the use of the batch system for running large scale jobs. The PRC is looking forward to the planned first stable release in October 2013 and an open session presentation at the upcoming PRC meeting in fall.

Librarian: Hayk Pirumov (from May 1st 2013)

Organisation

- **Conveners:** Voica Radescu, Ringaile Placakyte, Amanda Cooper-Sarkar
- **Release coordinator** (revision of the release candidates): Sasha Glazov
- **Librarian** (continuous revision/development of the main code and doxygen): Hayk Pirumov
- **Contact Persons:** Cristi Diaconu (H1), Klaus Rabbertz (CMS), Bogdan Malaescu (ATLAS), Olaf Behnke (ZEUS), Ronan [McNulty](#) (LHCb), Gavin Salam (theory)
- **Steering Group:** Voica Radescu, Ringaile Placakyte, Sasha Glazov, Amanda Cooper-Sarkar, Gavin Salam (theory), Klaus Rabbertz (CMS), Bogdan Malaescu (ATLAS), Ronan [McNulty](#) (LHCb), Olaf Behnke (ZEUS), Cristi Diaconu (H1, chair)
- **Getting help:** Send email to ✉ herafitter-help@desy.de

Recently two bug fixes:

- fitting of α_s with LHAPDF interface
- chi2 calculation (floating point error for data*prediction<0)

→ plan for **herafitter-0.3.1** bug fix release next week

Target: September – October 2013

Developments (short and long term for next releases):

- cleaning and restructuring of the code
- updates in DrawResults
- updates to the chi2 code
- for LHAPDF added calculation of errors in chi2
- improvements in the parametrisation style
- openMP

- ttbar in HATHOR → *Marco's talk*
- QED+QCD PDFs → *Michiel's talk*
- ACOT NNLO
- ACOT in QCDNUM
- nuclear PDFs
- intrinsic charm
- APPLGRID interfaces to DYNNLO
- LHAPDF in C++
- fitting photon PDFs
- different evolution codes, ...

Target: September – October 2013

Documentation:

- ongoing improvement in the manual, latest version stored on the web:

[HERAFitter / DownloadPage](#)



Releases of the HERAFitter QCD analysis package

- Versioning convention: **i.j.k** with
 - **i** - stable release
 - **j** - beta release
 - **k** - bug fixes.
- The release notes can be found in this attachment: [@HERAFitter_release_notes.pdf](#).

Date	Version	Files	Remarks
🌟 03/2013	0.3.0	@herafitter-0.3.0.tgz	latest release includes @manual-0.3.1.pdf and decoupled @theoryfiles.tgz
07/2012	0.2.1	@herafitter-0.2.1.tgz	fix release for 0.2.0
05/2012	0.2.0	@herafitter-0.2.0.tgz	added functionality for LHC users
09/2011	0.1.0	@herafitter-0.1.0.tgz	first release

Documentation

- paper:

decision for a short paper together with the stable release

Next User's meeting foreseen at the end of June

Please fill doodle:

<http://doodle.com/x7dchz453e76gptv>

Target: September – October 2013

decision for a short paper together with the stable release

Suggested content:

Introduction

Theoretical input:

*DIS
DY,
ttbar
jets,
dipole models
uPDFs
diffraction*

Methodology:

*parametrisation
chi2 definition
uncertainty treatment
reweighting technique*

User examples:

*default PDFs (HERAPDF1.0) with
different HF schemes
fits with LHC data
Bayesian Reweighting of PDFs
(using LHAPDF)*

Summary

NEWS on Conferences:

- ▶ Poster ready, presented by Hayk at LHCP
- ▶ Accepted talks:
 - ✧ Low X 2013 (this week)
 - ✧ Hadronic Structure 2013, Slovakia (beginning of july)
 - ✧ EPS (end of july)
 - ✧ QCD@LHC (september)
- ▶ HERAFitter Workshop in November?

Computing:

- ▶ Server in operation
- ▶ Bulk space on /afs/ under discussions of its split and sharing abilities
- ▶ Hfitter account used for doxygen documentation

Bug Fix release:

- ▶ bug fixes implemented: need a release: herafitter-0.3.1

Towards stable release:

- ▶ Last time was decided: “short” paper (no benchmarkings, but examples)
 - ✧ Journal proposals
- ▶ New deliverables

Next User’s meeting: doodle set