



HERAFitter User's Meeting status report



Announcements:

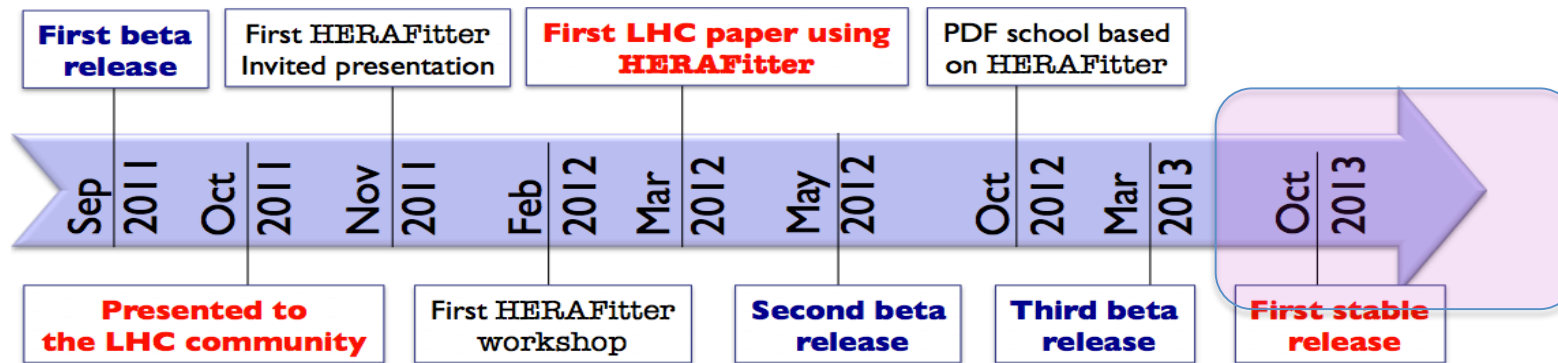
- Next meeting – proposal 29-31.07 – doodle:
<http://doodle.com/234iut5syrdi38ha>
- Conferences and Workshops:
 - LOWX2013 (30.5-4.6.2013)
 - HADRONSTRUCTURE13 (30.6-4.7.2013)
 - EPS2013 (18.7-24.7.2013)
 - QCD@LHC (2.9-6.9.2013)

list of talks+slides can be located at:

<https://www.herafitter.org/HERAFitter/HERAFitter/HERAFitterTalks>



HERAFitter time scale



Current releases: A bug Fix release 0.3.1 is available for download:

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 |
|---------|---------|--------------------------------------|---|
| 06/2013 | 0.3.1 | herafitter-0.3.1.tgz | fix release includes manual-0.3.1.pdf and decoupled theoryfiles.tgz |
| 03/2013 | 0.3.0 | herafitter-0.3.0.tgz | 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 |



Fixes in HERAFitter-0.3.1

- ◆ A new version available for download which contains the following fixes
 - fitting of α_s with LHAPDF interface ✓
 - chi2 calculation (floating point error for data*prediction<0) ✓
 - in asymmetric uncertainty treatment ✓
 - in the treatment of the statistical correlations ✓



New developments already available in the trunk

- ▶ Comparison of data and theory predictions including PDF uncertainties (using LHAPDF)

$$\chi^2 = \sum_i \left(\frac{\mu_i - m_i \left[1 + \sum_j b_j^{\text{exp}} \gamma_{ji}^{\text{exp}} + \sum_j b_j^{\text{theo}} \gamma_{ji}^{\text{theo}} \right]}{\Delta_i} \right)^2 + \sum_j (b_j^{\text{exp}})^2 + \sum_j (b_j^{\text{theo}})^2$$

Since **r1106** this extension is introduced to HERAFITTER. The computations are enabled by LHAPDFERRORS flag. Optional new flag SCALE68 can be used to scale the PDF uncertainties from 90% to 68% level.

(presented by S. Glazov
At developers meeting)

Example:

(plan to add similar
functionality for ABM
and NNPDF)

Fit 30 data points at NNLO, using CT10, MSTW08 and HERAPDF1.5 set (EIG-only):

| PDF set | Central PDF | With PDF uncertainties |
|---------------|-------------|------------------------|
| CT10 | 34.1 | 32.0 |
| MSTW08 | 72.0 | 49.7 |
| HERAPDF1.5eig | 43.1 | 39.2 |

→ for the ATLAS measurements, the conclusions do not change dramatically for the fit including uncertainties.



New developments already available in the trunk

- ▶ Also related to data comparison with predictions (computed elsewhere than HERAFitter):
 - ✧ Can add it as text file in a similar fashion as data
 - ➔ Allows to mix different theoretical sources of uncertainties in a chisquare comparison

&InTheory

! Fixed theory predictions, parallel to data files

```
InputTheoNames(1) = 'theo1.dat'
```

```
InputTheoNames(2) = 'theo2.dat'
```

```
InputTheoNames(3) = 'theo3.dat'
```

&End

- ▶ Chisquare calculation is extended to use parabolic approximation for asymmetric uncertainties.
- ▶ The chisquare code was updated to use covariance (syst or total) and/or correlation matrix (stat or syst)

$$\chi^2 = \sum_{i,j} (D_i - T_i) \text{Cov}_{i,j}^{-1} (D_j - T_j)$$

$$\text{Cov} = C^{\text{stat}} + C^{\text{uncor}} + C^{\text{corr}}$$

statistical uncorrelated correlated



New developments already available in the trunk

- ▶ freedom to user to change the name of the output directory in steering.txt

```
&OutDir
  ! Name of the directory where output will be stored (max 22 characters)
  OutDirName = 'output'
&End
```

- ▶ Dummy reaction type for testing formats (data central = theory)

```
Reaction = 'Dummy'
```

- ▶ Drawing package was also updated
- ▶ Running with multi processing: openMP (requires a library patch to QCDNUM)



HERAFitter developments perspectives

A list of planned developments:

◆ Theory (short and long terms):

- ▶ Consistent implementation of scale variations (✓) → ongoing
- ▶ ACOT NNLO. → ongoing
- ▶ QED PDF → ongoing
- ▶ Nuclear PDFs. → planned
- ▶ ACOT in QCDNUM, using fast convolution engine. → ongoing
- ▶ Improvements in $t\bar{t}$ cross-section calculation for fits, top studies → ongoing
- ▶ Intrinsic charm → planned
- ▶ EW corrections → planned
- ▶ low x models: → ongoing
 - ✧ Dipole/saturation
 - ✧ resummation
 - ✧ kt -factorisation

- ▶ DYNNLO in APPLGRID. → indirectly related but would facilitate NNLO fits (Pavel)
- ▶ Different evolution schemes:
 - ✧ e.g. matched to MC showering, mixed Dipole-DGLAP fits.

◆ Data treatments:

- ▶ Additional tools to transform covariance matrix to nuisance parameter representation
- ▶ Alternative to MINUIT minimization package
- ▶ improvement in the pdf parameterisation style

- ▶ HERAverager: alpha version available: <https://wiki-zeuthen.desy.de/HERAverager>



Today's Agenda

◆ Today's agenda:

Wednesday, 26 June 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)) Material: Slides  | |
| 15:40 - 16:00 | News from LHCb 20' Speaker: Peter James Lowdon (Universitaet Zuerich (CH)) Material: Slides  | |
| 16:00 - 16:20 | Fitting photon+jet data (from ep ZEUS) 20' Speaker: Oleg Kuprash (DESY) | |