HERAFitter User's Meeting status report

Announcements:

- Next meeting – proposal doodle:
  http://doodle.com/bknmnbbvx2ye825b

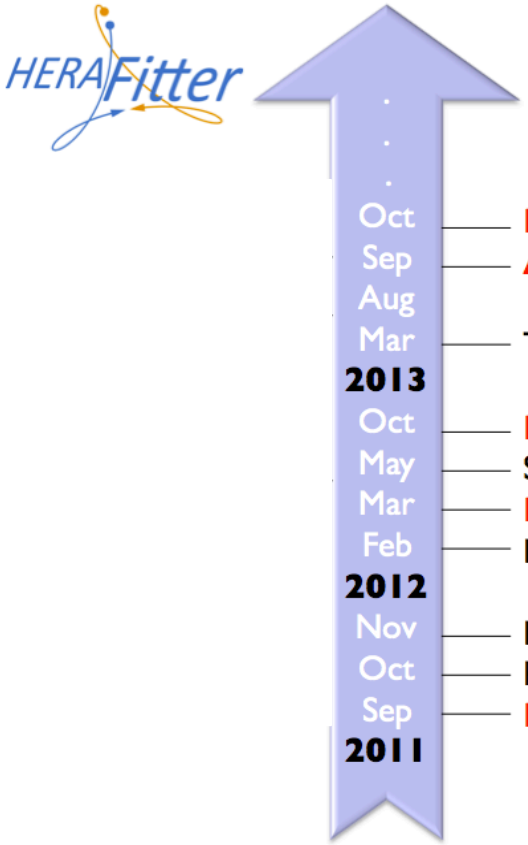
- Conferences and Workshops:

List of Presentations

Date	Conference/Workshop	Presenter	Link	Remarks
16-20.12.2013	HEP in the LHC Era 2013	TBA	HERAFitter talk	stable release
13.12. 2013	PDF4LHC	S. Camarda	HERAFitter talk	stable release
2-4.12.2013	Helmholtz Alliance "Physics at the Terascale"	R&V	HERAFitter talk	stable release
14-15.11.2013	QCD tools for LHC	R. Placakyte	talk on quark PDFs (LHC)	HERAFitter slides adverts
4-8.11.2013	HADRON2013	V. Radescu	dedicated talk	beta3.1/stable release
24.10.2013	PRC76 open session	R. Placakyte	talk	HERAFitter project overview

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

HERAFitter time scale



First HERAFitter Stable Release — Coming soon

Award winning poster at the conferences:
ICNPF and TOP2013

Third HERAFitter Beta Release

First PDF School based on HERAFitter

Second HERAFitter Beta Release

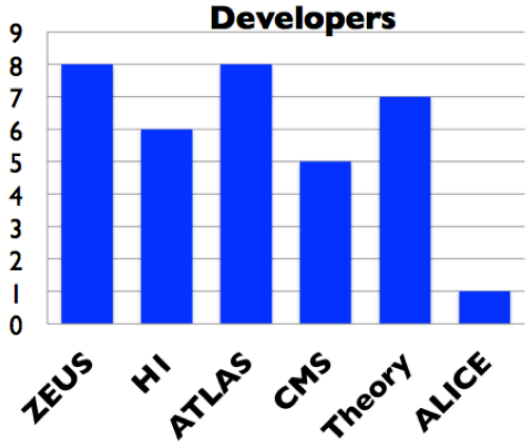
First LHC paper using HERAFitter

First HERAFitter Workshop

First HERAFitter Invited presentation

Presented to the LHC Community

First HERAFitter Beta Release



Stable release under way …

New features in the stable release

Next release will contain more features and better documentation

- Improved quantitative comparison with predictions:
  - Including PDF uncertainties (extended to all PDF groups formats)
  - Possibility to compare with external predictions
- Possibility to use asymmetric uncertainties
- Added more options for chisquare representation
- Bug fix in reweighting code based on Hessian PDF sets
- Enabled LO PDF fits
- improved uPDF interface ✔
- Large improvements in the drawing tools
  - Multiple overlay option for individual PDF
  - data vs prediction, pull plots
- Multi-processor performance using OpenMP
- **Generalised APPLGRID interface: ✔**
  - **Parser to identify theory expressions**
  - **Possibility to choose the CKM values from applgrid or HERAFitter**
- Generalised minimisation ✔
- Possibility to fit Lead PDF ✔
- Possibility to fit QED PDF (generalised QCDNUM package, ✖)
- Improved Parametrisation style ✔

New developments: APPLGRID Interface

Theory expression parser in HERAFITTER

Recognizes simple algebraic expression with terms denoting predictions from APPLgrid, k-factors, (etc in the future) and calculates the result for each fit iteration.

- k-factor + corrections: k*A+C:
  k – vector of k-factors taken from txt file (kfactor term type)
  A - applgrid prediction (applgrid term type)
  C – vector of corrections (kfactor type, similar treatment)
- asymmetry: (A1-A2)/(A1+A2):
  A1,A2 – applgrid terms
- Scaling with digital numbers: 1.02*k*A or k*A/1e5:
  used for offsets, or unit specifications
- Sum, averaging (not thorougly tested): A/sum(A) or A/avg(A):
  prediction normalization.

Also, there is a possibility to flag a data bin not to be used in the studies…

New developments: APPLGRID Interface

```
   ColumnType = 'Flag', 2*'Bin','Sigma',5*'Error'
   ColumnName = 'binFlag', 'eta1','eta2','Asymmetry','stat',4*'ignore'
!  ColumnName = 'eta1','eta2','Asymmetry','stat','corSY','corEn','corCh','corEff'

   NInfo    = 5
   DataInfo = 7000., 1, 35., 0., 1.
   CInfo    = 'sqrt(S)', 'asymmetry','pte cut','ptnu cut', 'theoryunit'
   IndexDataset = 672

   Reaction = 'CC pp'

TheoryType      = 'expression'
TermName = 'A1', 'A2'
TermType = 'applgrid','applgrid'
TermSource = 'theoryfiles/cms/SPM_12_001/CMS-PAS-SMP-12-001-Wplus_eta4.root',
             'theoryfiles/cms/SPM_12_001/CMS-PAS-SMP-12-001-Wminus_eta3.root'
TheorExpr= '(A1-A2)/(A1+A2)'

   Percent = False, False, False, False, False ! absolute errors

!y1   y2    Combined Normalized CS    d(Combined Normalizec CS)
&End
1  0.0 0.2 0.102 0.003 0.0018 0.0006 0.0001 0.0045
1  0.2 0.4 0.111 0.003 0.0025 0.0006 0.0001 0.0044
1  0.4 0.6 0.116 0.003 0.0027 0.0003 0.0001 0.0044
1  0.6 0.8 0.123 0.003 0.0025 0.0003 0.0001 0.0044
1  0.8 1.0 0.133 0.003 0.0019 0.0006 0.0001 0.0044
1  1.0 1.2 0.136 0.003 0.0024 0.0010 0.0001 0.0049
1  1.2 1.4 0.156 0.003 0.0026 0.0008 0.0001 0.0054
0  1.4 1.6 0.160 0.100 0.0026 0.0008 0.0001 0.0054
1  1.6 1.8 0.166 0.003 0.0031 0.0008 0.0001 0.0092
1  1.8 2.0 0.197 0.003 0.0020 0.0016 0.0002 0.0087
1  2.0 2.2 0.224 0.003 0.0020 0.0026 0.0003 0.010
1  2.2 2.4 0.210 0.004 0.0029 0.0024 0.0003 0.0125
```

Optional flag,
Default uses all data point

Ex in building asymmetry:
Define the expression

Optional bin info:
1 bin included
0 bin excluded

New developments: APPLGRID Interface

- Compilation/compatibility issues:

HERAFitter with --enable-applgrids works only with v1.4.33 onwards

→ FIXED by adding a warrning if older than 1.4.33 version is used (not possible to set CKM from HERAFitter)

"W: Cannot set CKM in Applgrid, use v1.4.33 or higher"

→ Applgrid v1.4.33 problematic under gcc 4.7.2 (works on lxplus and gcc 4.6.3)

- Interface of the CKM matrix in Applgrids and HERAFitter:
  - A global FLAG defined in the main steering.txt to define the choise of the CKM matrix: CKM values from the Applgirds or HERAFitter

```
! Flag to define if native APPLgrid CKM values should be kept.
LUseAPPLgridCKM = True
```

New developments: APPLGRID Interface

CMK from grids CMK from HERAFittter

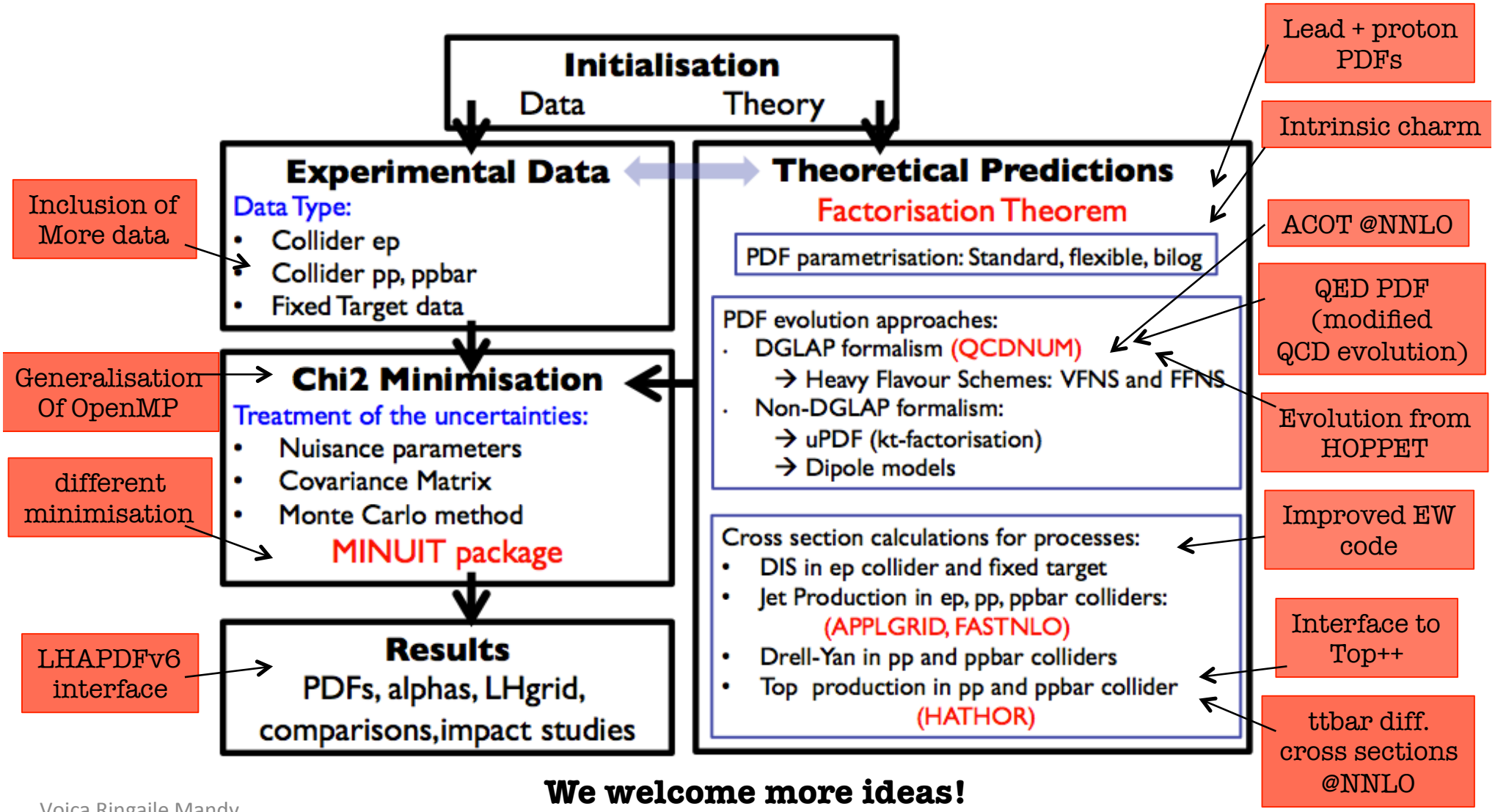
	AG CKM	HF CKM
Dataset 5	28.13	24.68
ATLAS W+ l pseudorapidity, 2010 data		
	629.319	619.972
	630.444	621.274
	630.859	621.939
	631.514	622.979
	636.335	628.177
	638.422	631
	644.955	638.183
	639.319	633.278
	632.547	627.278
	622.013	617.534
	581.23	577.78

	AG CKM	HF CKM
Dataset 6	14.14	16.43
ATLAS W- l pseudorapidity, 2010 data		
	456.669	447.473
	453.83	444.759
	449.865	441.02
	444.053	435.573
	436.929	428.85
	424.497	417.144
	415.413	408.725
	402.784	396.746
	386.36	381.12
	370.965	366.538
	345.497	342.062
Correlated Chi2	4.3983	3.4470

HERAFitter Perspectives

HERAFitter has a modular structure facilitating fast developments

- Many new developments are planed to be implemented in future releases:



We welcome more ideas!

Post Stable Release efforts

- **Theory side:**

→ QED+QCD PDFs (generalised evolution in QCDNUM)

→ first comparison of APFEL with QCDNUM performed by Renat:

→ small differences for photon and others PDFs at large-x

→ possibility to interface APFEL (A PDF Evolution with QED corrections)

Top sector:

→ ttbar differential cross sections

→ inclusion of Top++ (total top pair production)

Heavy flavour sector:

→ ACOT scheme at NNLO

→ ACOT scheme inclusion in QCDNUM

→ intrinsic charm

- **Interfaces and code:**

→ APPLGRID interfaces to DYNNLO

→ LHAPDF6 (C++) interface

→ OpenMP (currently exist for RT scheme, planned to extend to ACOT)

- **Others:**

→ fitting photon PDFs

→ different evolution codes, ...

Today's Agenda

Video Services Vidyo public room : HERAFitter_Users_meeting Hide info | **Join Now!** | Connect 42-R-031

Room name	HERAFitter_Users_meeting
Extension	9242782
Meeting PIN	2323
Moderator	Voica Ana Maria RADESCU
VidyoVoice phone numbers	Full List
Description	HERAFitter Users meeting
Auto-join URL	http://vidyoportal.cern.ch/flex.html?roomdirect.html&key=77Hzb42aIjhF

Tuesday, 19 November 2013

15:00 - 15:20 **Status** *20'*

Speakers: Voica Ana Maria Radescu (Deutsches Elektronen-Synchrotron (DE)), Ringaile Placakyte (Deutsches Elektronen-Synchrotron (DE))

15:20 - 15:40 **Report from Developers:** *20'*

15:40 - 16:00 **APFEL program - news** *20'*

Speakers: Juan Rojo Chacon (CERN), Stefano Carrazza (Università degli Studi e INFN Milano (IT)), Valerio Bertone (CERN)

16:00 - 16:20 **Discusions with Users** *20'*