

# HERAverager status update

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HERAfitter user's meeting

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- Averaging is based on the  $\chi^2$  minimization

$$\chi^2(m, b) = \sum_i \frac{[m^i - \sum_j \Gamma_j^i b_j - \mu^i]^2}{\Delta_i^2} + \sum_j b_j^2$$

- $\mu_i$  is a measured central value
  - $m_i$  is a prediction for the measurement
  - $\Gamma_j^i$  is a matrix of correlated systematics
  - $\Delta_i^2$  is a squared sum of squared stat. and uncorr syst. uncertainties
  - $b_j^2$  is a shift of the corr. systematic
- The minimum condition  $\frac{\partial \chi^2}{\partial m} = 0$ ,  $\frac{\partial \chi^2}{\partial b} = 0$  leads to the system of linear equations with a block structure

$$\begin{pmatrix} A_M & A_{SM} \\ (A_{SM})^T & A_S \end{pmatrix} \begin{pmatrix} M_{ave} \\ S_{ave} \end{pmatrix} = \begin{pmatrix} C_M \\ C_S \end{pmatrix},$$

which allows us to obtain the averaged central values and shifts of the corr. systematics.

- The calculation of the swimming corrections  $\sigma_{new} = \sigma_{orig} \left[ \frac{\sigma_{new}}{\sigma_{orig}} \right]$  is performed using the HERAFitter. The theoretical cross sections are calculated using theory packages implemented in the HERAFitter.



## Launch: **./HERAverager steering**

The steering file has been approached to the HERAFitter steering format

```
&InFiles
! Specify data files to be averaged
NInputFiles = 4
InputFileNames(1) = '../test/h1460new.public.dat'
InputFileNames(2) = '../test/h1575new.public.dat'
InputFileNames(3) = '../test/zeus460.public.dat'
InputFileNames(4) = '../test/zeus575.public.dat'
&End
```

Other options are also available in the steering file.

The user's manual which includes a description of all options has been written.



The first version of the manual will be distributed between the developers and improved based on a feedback.

- `h1575new.public.dat` — H1 inclusive NC  $E_p = 575$  GeV<sup>2</sup> dataset for testing
- `zeus575new.public.dat` — ZEUS inclusive NC  $E_p = 575$  GeV<sup>2</sup> dataset for testing

The description of the averaging procedure which is implemented in the source files can be found in the correspondent chapter. Here we pay attention only to the practical usage of the averager.

## 0.4 Steering file

The launch of the test averaging inside the directory `./bin` is performed by the command:

```
>./HERAverager ../test/steering
```

The steering is a plain text file which consists of the following namelists:

`InFiles` defines the datasets to be averaged

`CommonGrid` defines the common bin grid

`HERAverager` defines the type for averaging of bins from one experiment

`BiasCorrection` contains options for type of the bias correction

`Swimming` defines the type for searching the common bins

`DIS` contains options applicable for DIS datasets

All options and possible values of them are listed in Table 1.





## Code improvements

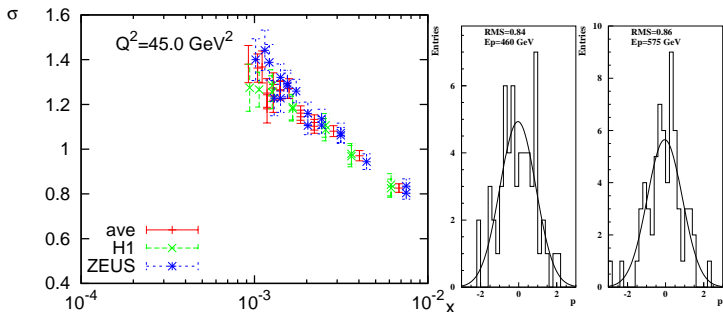
The performed improvements of the `HERAverager` during the last month include:

- Cleaning of the code (has not finished yet)...
- Some bugs (also with some misunderstandings of NC and CC datasets) have been found and fixed.
- The compatibility with the `HERAFitter` has been improved: usage of the environment variables for calling of the `HERAFitter`, longer file names in the `HERAFitter` itself.
- The dimensions of the internal arrays has been adjusted to work on different computer systems and it seems that it works well, but probably takes more memory than needed.
- The averaging of the multiple processes has been tested. The results are good, but it revealed the necessity to improve the output format and to make more flexible plotting tools.



## Code improvements

- The output of pulls has been returned to the old format and plots can be done using dedicated kumac.
- Improvement of automatic plotting tool for different processes is in progress...



## Summary and outlook

- The documentation has been written and will be improved.
- The technical and cosmetic improvements have been performed and will be performed before the release.
- The problem with the internal arrays will be additionally checked.
- The current version has been tested and the results repeat the previous ones.  
In addition the avereger also will be tested on complete HERA II average.
- The stable version will be released in a month (together with the HERAFitter).



Thank you so much for your attention

