Evaluation of fastNLO tables

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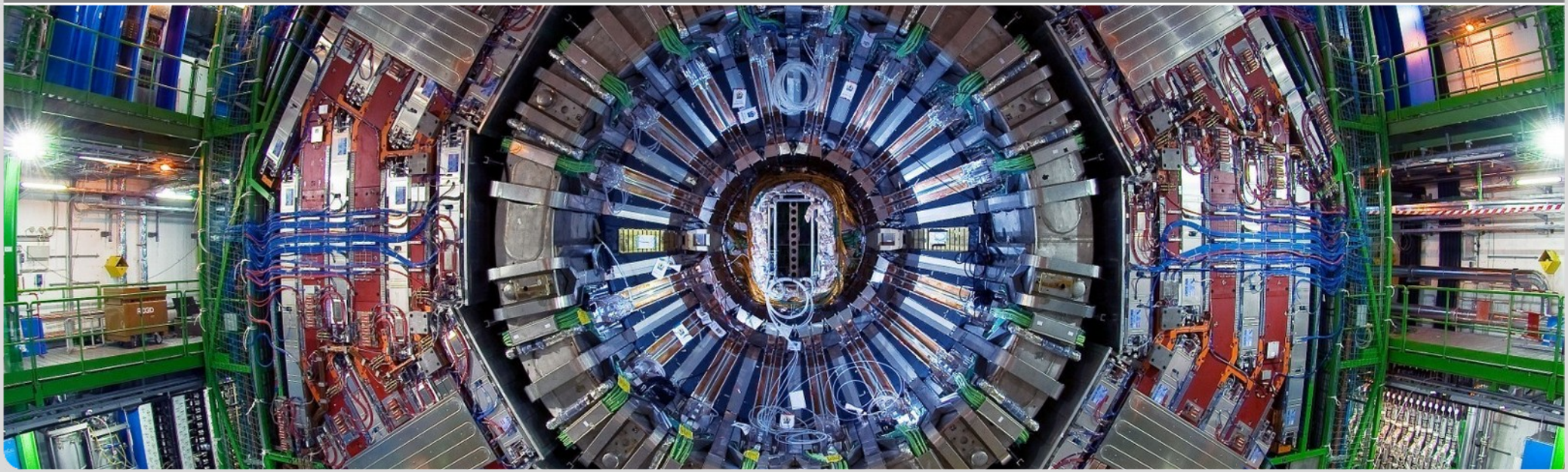
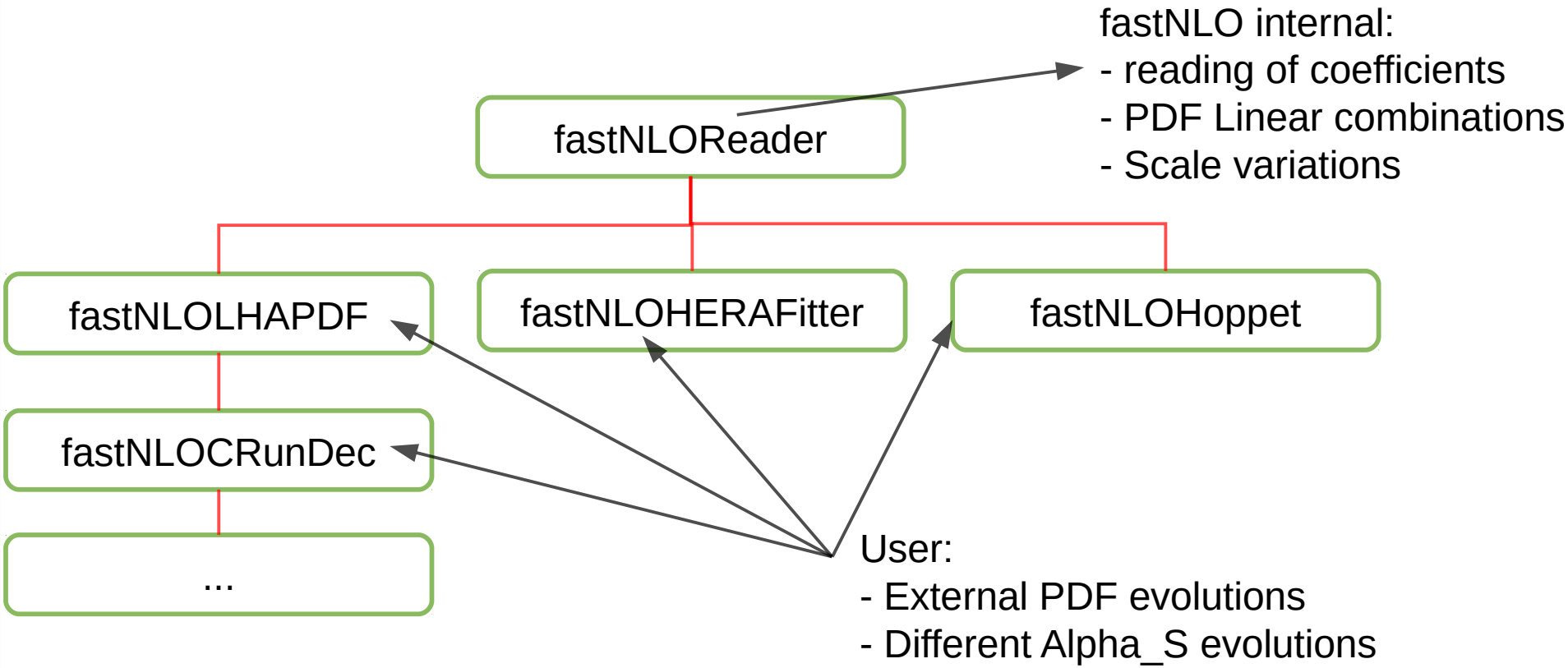


Structure of the fastNLO reader interface

- Class structure of the fastNLO reader code



Evaluation of fastNLO tables

- In addition to a fastNLO table two more ingredients are needed
  - the PDF
  - an alpha_S evolution
- The user can freely define these and pass them to the fastNLO reader code

```
class fastNLOUser : public fastNLOReader {

public:
   fastNLOUser(string tablename);

protected:
   // inherited functions
   double EvolveAlphas(double Q) const ;
   vector<double> GetXFX(double xp, double muf) const ;
```

Example of a fastNLO Reader interface

copied from the HERAFitter repository

```
FastNLOHeraFitter::FastNLOHeraFitter(string tablename) :
fastNLOReader(tablename) {
}

double FastNLOHeraFitter::EvolveAlphas(double Q) const {
   // Implementation of Alpha_s evolution as function of the
   // factorization scale [and alphas(Mz)].
   double mu2 = Q*Q;
   return HF_GET_ALPHAS_WRAP( &mu2 );
}

vector<double> FastNLOHeraFitter::GetXFX(double xp, double muf) const {
   //  GetXFX is used to get the parton array from the
   //  pdf-interface. It should return a vector of 13
   //  parton flavors from tbar to t at a certain
   //  x-proton and factorisation scale.
   double muf2 = muf*muf;
   vector < double > xfx(13);
   HF_GET_PDFS_WRAP(&xp, &muf2, &xfx[0]);
   return xfx;
}
```

Example code

- Simple example how to calculate a cross section

```
//-- Tablename
string tablename = "fnl1014_I902309.tab";
//---  PDF set
string PDFFile = "CT10nlo.LHgrid";


// --- this is your playground to use fastNLO
//  Calculate cross setions and/or test some options

//--- example calculation
fastNLOLHAPDF fnlo(tablename,PDFFile,0);     // initialize a fastNLO instance
                                             // with interface to LHAPDF.
fnlo.PrintTableInfo();                       // print some information
fnlo.CalcCrossSection();                     // Calculate the cross section
fnlo.PrintCrossSections();                   // Print cross section to screen

vector<double> cs = fnlo.GetCrossSection();  // Access cross sections
```

Theory/Data comparison using Rivet tools

- Using the tool 'fnlo-tk-yodaout', we fill histograms that can be fed into the Rivet plotting tools

```
$ fnlo-tk-yodaout fnl2342b_I902309_HepForge.tab CT10nlo.LHgrid
$ fnlo-tk-yodaout fnl2342b_I902309_HepForge.tab HERAPDF15NLO_EIG.LHgrid
```

- The virtual machine ships an ancient Rivet version not yet supporting YODA but the old format AIDA. So we convert the histograms to the old format

```
$ yoda2aida CT10nlo_1_1.yoda
$ yoda2aida HERAPDF15NLO_EIG_1_1.yoda
```

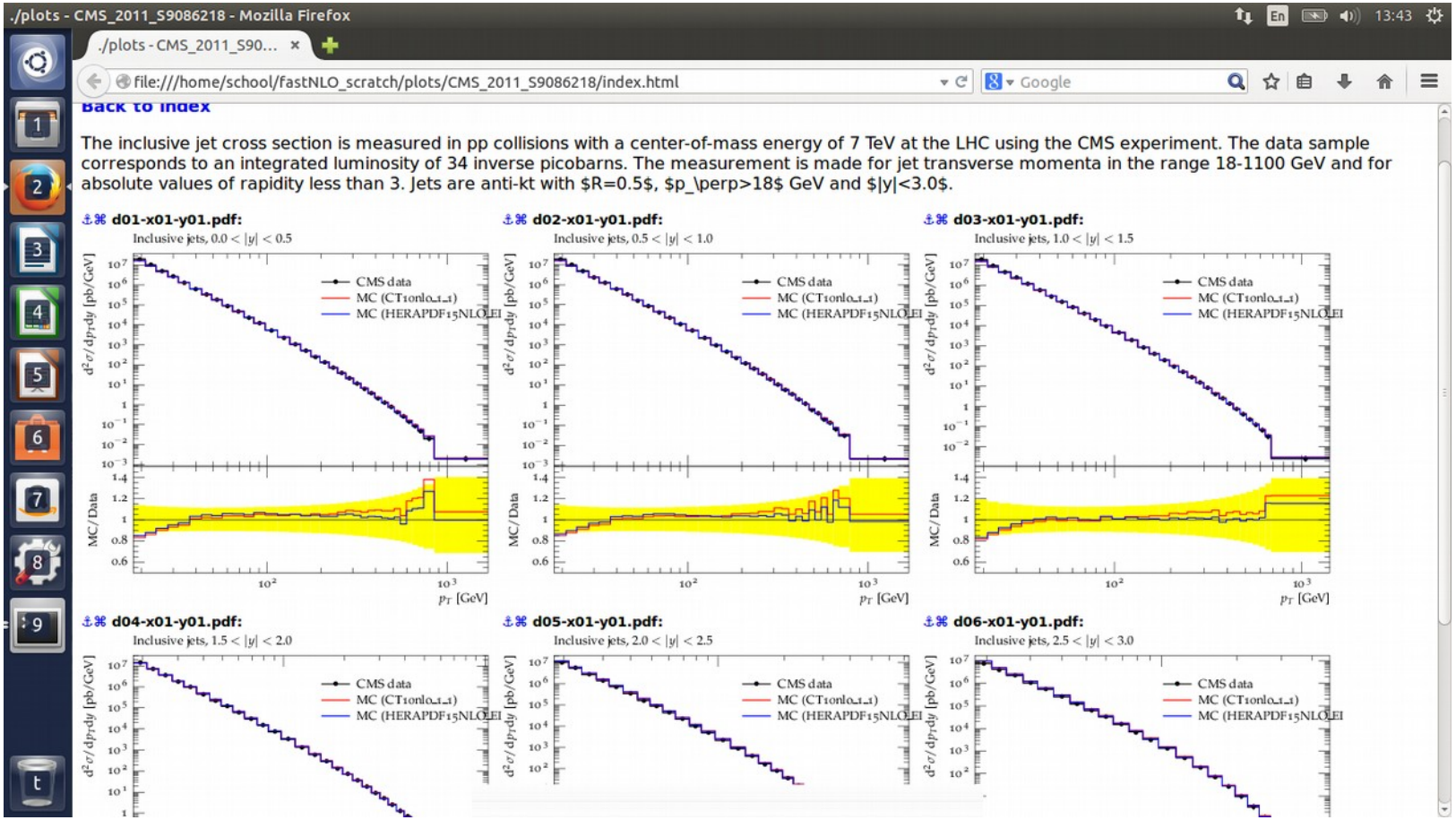
- Now we can use the Rivet plotting tool to create the figures

```
$ rivet-mkhtml CT10nlo_1_1.aida HERAPDF15NLO_EIG_1_1.aida
```

- and look at them in a browser

```
$ firefox plots/CMS_2011_S9086218/index.html
```

Theory/Data comparison using Rivet tools



Changing the value of alpha_S

- Easiest way is to use a PDF from LHAPDF which was determined with the wished alpha_S value

```
$ fnlo-tk-yodaout fnl2342b_I902309_HepForge.tab CT10nlo_as_0124.LHgrid
```

- Again we have to convert the YODA histogram into the old AIDA format

```
$ yoda2aida CT10nlo_as_0124_1_1.yoda
```

- Use the Rivet plotting tool to create the figures

```
$ rivet-mkhtml CT10nlo_1_1.aida CT10nlo_as_0124_1_1.aida
```

- and look at them in a browser

```
$ firefox plots/CMS_2011_S9086218/index.html
```

Theory/Data comparison using Rivet tools