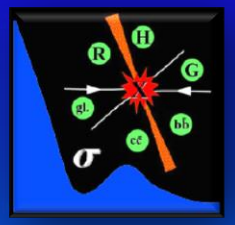


IHEP Diffractive Group

V.A. Petrov, R.A. Ryutin,
A.A. Godizov, V.D. Samoilenko

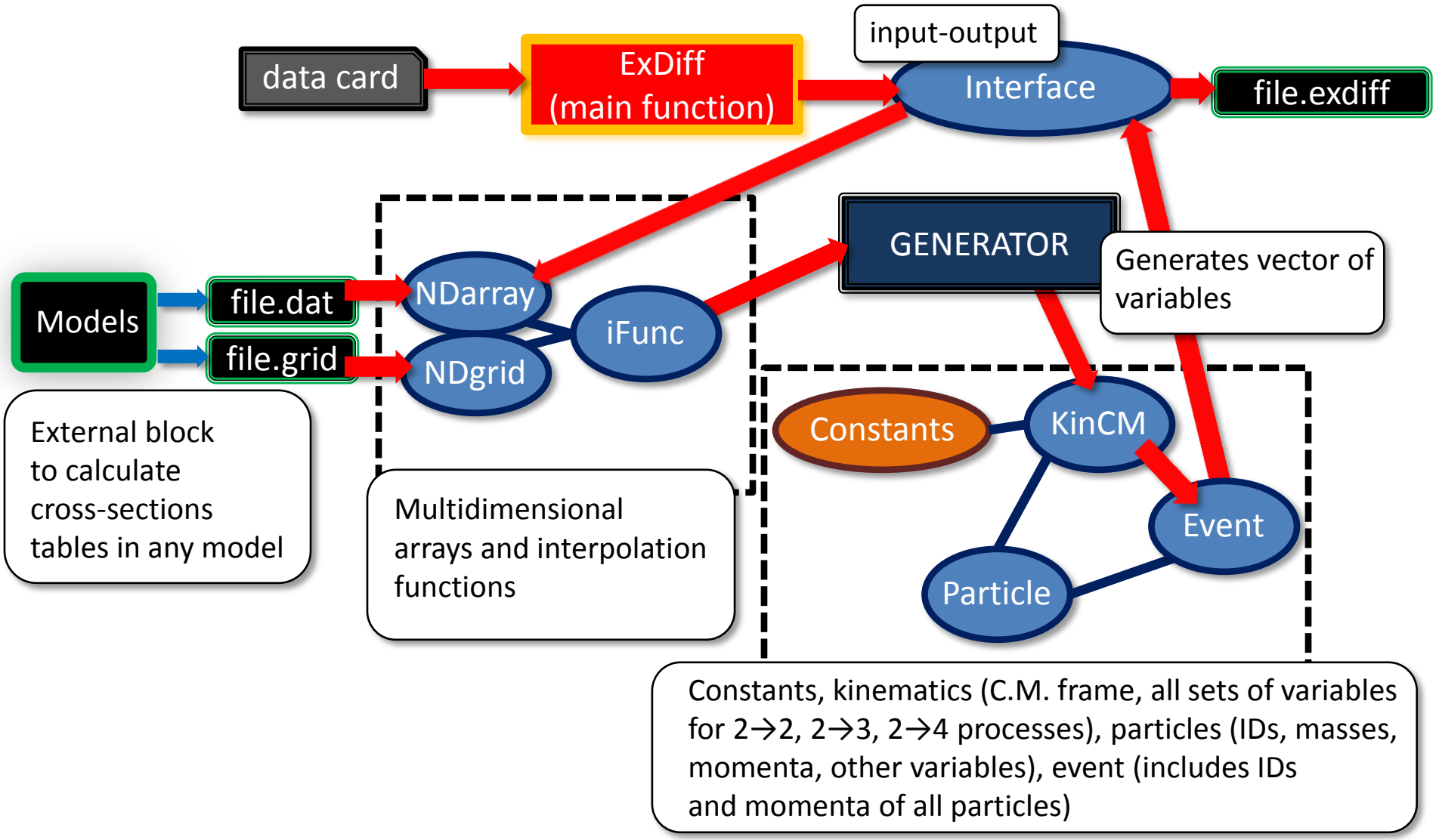
ExDiff1.0

Status and plans

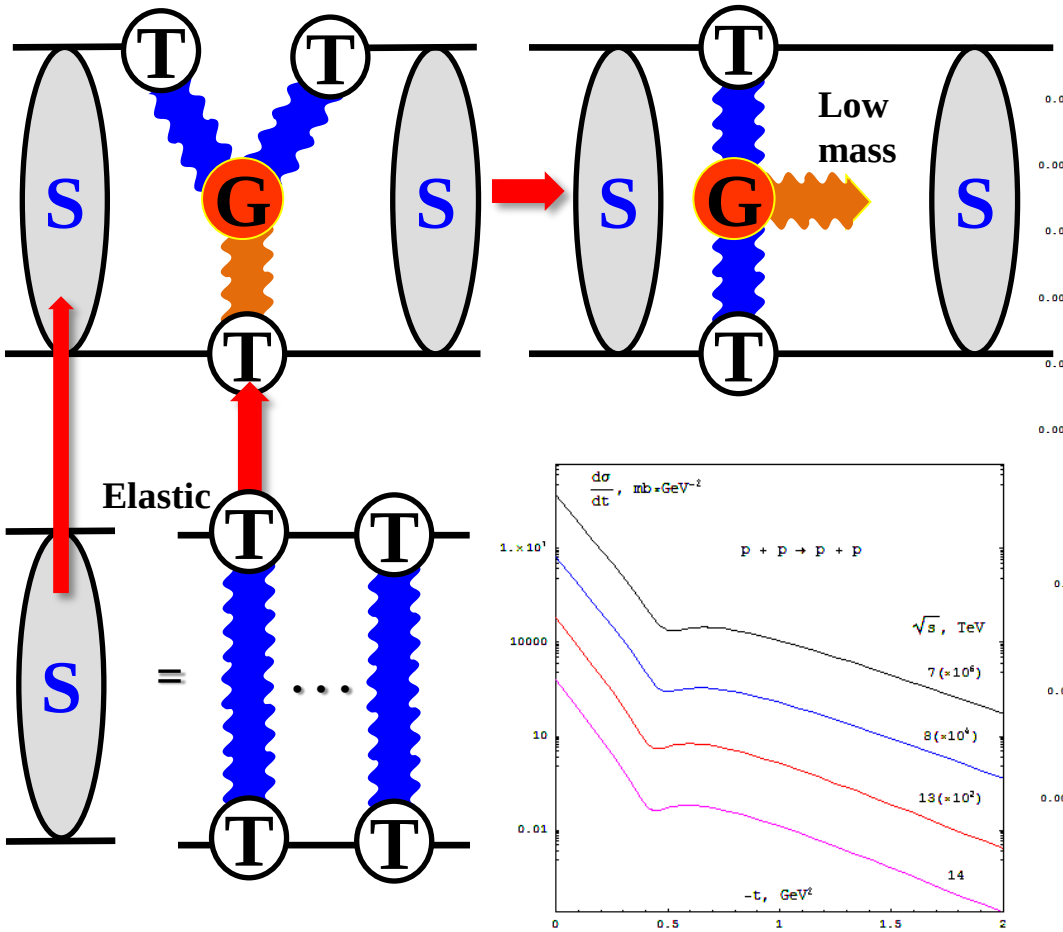
Roman Ryutin

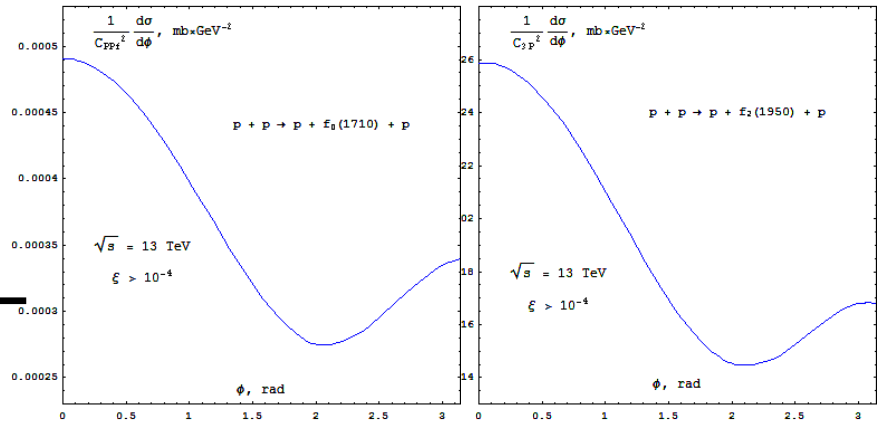
IHEP, Protvino

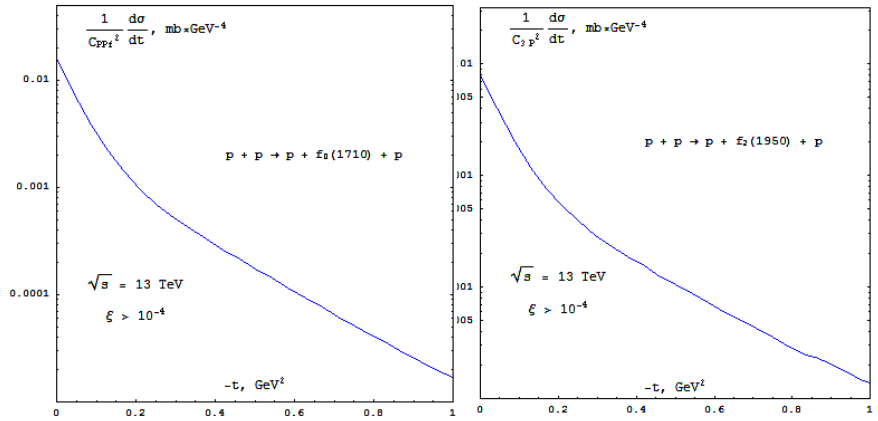
ExDiff1.0 basic structure (classes & files)



ExDiff1.0 models







A.A. Godizov, *Effective transverse radius of nucleon in high-energy elastic diffractive scattering,* **Eur.Phys.J.C (2015) 75: 224**

A.A. Godizov, *The ground state of the Pomeron and its decays to light mesons and photons,* **Eur.Phys.J.C (2016) 76: 361**

A.A. Godizov, *High-energy single diffractive dissociation of nucleons and the 3P-model applicability range,* **Nucl.Phys.A (2016) 955: 228**

ExDiff installation and use

1. Copy files to your folder
2. Change the ***.card** file (in the **config** folder by default)
3. Go to the folder with **main.cpp**
4. **> make**
5. **> ExDiff <cardfile name> [<output file name>]**
6. **> cd output**
7. see output file (in the **output** folder by default)

You can find **examples of configuration files** for different cases in the **config** folder. You have to change number of events only.

elastic7.card,elastic8.card,elastic13.card,elastic14.card, cep13_f1710.card,cep13_f1950.card

ExDiff1.0 has been tested at **lxplus7.cern.ch**

ExDiff data card file

```
1  0  0  1  1000  0  0
=============================================================================
IDauthors IDprocess IDenergy version Nevents IDinput_format IDoutput_format
=============================================================================
```

- `IDauthors` defines authors of the model used for a process:
  `IDauthors=1`: A. Godizov (only one for this version).

- `IDprocess` defines the process:
  `IDprocess=0`: elastic $p + p \to p + p$ scattering;
  `IDprocess=1`: ECDP of low mass resonance $f_0(1710)$, $p + p \to p + f_0(1710) + p$;
  `IDprocess=2`: ECDP of low mass resonance $f_2(1950)$, $p + p \to p + f_2(1950) + p$;

- `IDenergy` defines the collision energy of the process:
  `IDenergy=0`: 13 TeV; (for all processes in this version)
  `IDenergy=2`: 7 TeV; (only for elastic in this version)
  `IDenergy=3`: 8 TeV; (only for elastic in this version)
  `IDenergy=4`: 14 TeV; (only for elastic in this version)

- `version` is auxiliary parameter that is used to define different versions. Default value is 1.

- `Nevents` defines number of events to generate.

ExDiff intrinsic input/output

- `IDinput_format` defines a set of variables for kinematics. Default value is 0. It means that we use the following sets of variables: $\{t, \phi\}$ (elastic scattering); $\{\tau_1, \tau_2, \phi_0, \ln\xi_1, \phi_1\}$ (CED resonance production); $\{\tau_1, \tau_2, \phi_0, \ln\xi_1, \phi_1, \eta, \phi_a\}$ (CED di-jet, di-hadron, di-boson production).

- `IDoutput_format` defines output format. Default value is 0. In ExDiff v1.0 the simple file `../ExDIff1.0/output/A1M1E0_1F0.exdiff` generated, where the output looks like

```
============================== ExDiff Event ================================
--------------------------------------------------------------------------
ID            E           px            py            pz
--------------------------------------------------------------------------
2212  6.50000000e+03  0.00000000e+00  0.00000000e+00  6.49999993e+03
2212  6.50000000e+03  0.00000000e+00  0.00000000e+00 -6.49999993e+03
--------------------------------------------------------------------------
2212  6.49922495e+03  1.20107011e-01  1.07105789e-01  6.49922488e+03
10331 1.72153048e+00 -3.95672633e-02 -9.27803302e-02 -1.71445119e-01
2212  6.49905351e+03 -8.05397481e-02 -1.43254592e-02 -6.49905344e+03
==========================================================================
============================== ExDiff Event ================================
--------------------------------------------------------------------------
ID            E           px            py            pz
--------------------------------------------------------------------------
2212  6.50000000e+03  0.00000000e+00  0.00000000e+00  6.49999993e+03
2212  6.50000000e+03  0.00000000e+00  0.00000000e+00 -6.49999993e+03
--------------------------------------------------------------------------
2212  6.49922495e+03  1.20107011e-01  1.07105789e-01  6.49922488e+03
10331 1.72153048e+00 -3.95672633e-02 -9.27803302e-02 -1.71445119e-01
2212  6.49905351e+03 -8.05397481e-02 -1.43254592e-02 -6.49905344e+03
==========================================================================
```

`A<IDauthor>M<IDprocess>E<IDenergy>_<version>F<IDinput_format>.exdiff`

Methods and variables to connect external software

Interface.cpp ExDiff::Interface::GenerateFile()

```
239
240  // FOR DEVELOPERS ================================================================================
241  // You can use directly all the parameters of particles in the event
242  // to make your own output or connection to your software
243  // instead of the string
244
245          ev.AddToFile(outformat,outputfile);
246
247  // use your own method with the following parameters of all particles in the event
248  // i: 0 => ev._particles().size()-1 [i changes 0=>3 (2 to 2), 0=>4 (2 to 3) and 0=>5 (2 to 4)]
249  // ev._particles().size() = number of particles in the event
250  // ev._particles()[i]._ID() = ID of the particle
251  // ev._particles()[i]._m() = mass of the    particle
252  // ev._particles()[i]._E() = energy of the  particle
253  // ev._particles()[i]._px() = px of the particle
254  // ev._particles()[i]._py() = py of the particle
255  // ev._particles()[i]._pz() = pz of the particle
256  // FOR DEVELOPERS ================================================================================
257
```

TO DO list (2017)

- Manual (almost ready) & twiki-page **(March)**
- Interface to Pythia and CMS software. HEPMC output. **(April)**
- Processes to add
  - low mass process **p + p → p + ππ + p** with the sub process
    IP + IP → π + π (April-May)
  - high mass processes **p + p → p + X + p**, with sub processes
    g(IP) + g(IP) → H, R, Graviton, $\chi_{c,b}$,
    gg , QQbar, γγ, ψψ, ηη', ZZ, WW, …
    (June-October)
  - high mass processes **p + p → p + X + p**, with sub processes
    γ + IP(g) → Z, ϒ, J/ψ, …
- Theoretical model development **(All the year)**