String Hadronization

These two analysis examples are taken from **examples/expl1.optns** (string hadronisation). Please refer to the "Complete examples" section to get a complete description of the simulation configuration.

Transverse momentum distribution

```
!--------------------------------
! Define analysis (pt distribution)
!--------------------------------

beginanalysis
  histogram
    pt      ! x = transverse momentum
    numptl  ! y = number of particles
    11 ! normalisation code (per event, per bin width)
    0  ! x-min
    5  ! x-max
    10 ! number of bins
  trigger rap -1 1 ! rapidity range
  set hisfac 0.5   ! divide by rapidity range
  idcode 120  idcode -120  ! charged pions
  idcode 130  idcode -130  ! charged kaons
  idcode 1120 idcode -1120 ! protons and antiprotons
endanalysis


!----------------------------------------------------
! Write out final results to output file
!----------------------------------------------------

write "pt distribution"
histoweight
writearray 3 ! creates 3-column table in z-expl1.histo: x, y, y-error
```

Define analysis

We first define *xvariable* as **pt** (transverse momentum) and *yvariable* as **numptl** (number of particles). The following four numbers define: the normalisation code (**11** means that we perform a normalisation, dividing by the number of events and by the bin width), the transverse momentum range (from **0** to **5**) and the number of bins (**10**).

A trigger is set to get only particles with rapidity in range [-1, 1].

A normalisation factor of **0.5** is used.

The **idcode** commands define the particles of interest. Please refer to **src/KWt/idt.dt** to get EPOS identifier values. In this example, we only focus on charged pions (π^+, π^-), charged kaons (K^+, K^-), protons and antiprotons ($p, \overline{p}$).

Output

This example will create a p_T distribution (d^2N/dp_Tdy), for charged pions (π^+, π^-), charged kaons (K^+, K^-), protons and antiprotons ($p, \overline{p}$), within $-1 < y < 1$ (y being the rapidity), distributed in 10 bins between $p_T = 0$ and $p_T = 5$ GeV.

The command **write** defines the histogram title (here: **pt distribution**).

The command **histoweight** prints the histoweight value.

Finally, the command **writearray 3** creates a 3-column table with x, y and y-error values.
The analysis results are written in the file **${HTO}z-expl1.histo**.

```
              pt distribution
              histoweight 0.30000000000000E+04
              array 3
              0.2500E+00 0.2924E+01 0.3122E-01
              0.7500E+00 0.1620E+01 0.2324E-01
              0.1250E+01 0.6983E+00 0.1526E-01
              0.1750E+01 0.3437E+00 0.1070E-01
              0.2250E+01 0.1690E+00 0.7506E-02
              0.2750E+01 0.8867E-01 0.5437E-02
              0.3250E+01 0.4433E-01 0.3844E-02
              0.3750E+01 0.1933E-01 0.2539E-02
              0.4250E+01 0.7333E-02 0.1563E-02
              0.4750E+01 0.4000E-02 0.1155E-02
              endarray
```
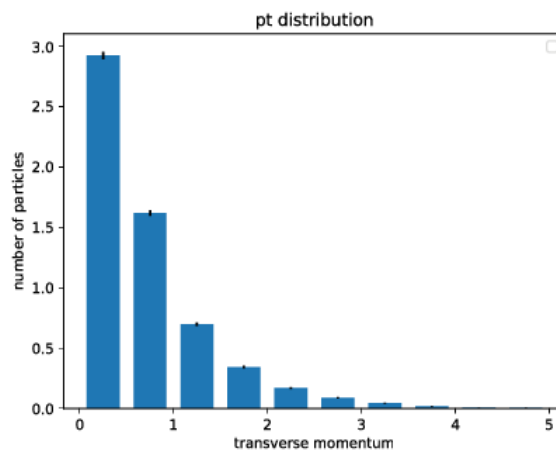
We get 10 bins with transverse momentum values in the range $[0, 5]$ with a total of 3000 events.

One can then build and display the plot with one's own plotting tool. Here are the plot created with a simple python script using the matplotlib package.

Rapidity distribution

The file **examples/expl1.optns** contains another histogram definition corresponding to a rapidity distribution.

```
!-------------------------------------------------------
! Define analysis (rapidity distribution)
!-------------------------------------------------------
beginanalysis
  histogram
    rap     !x = rapidity
    numptl  !y = number of particles
    11      !normalisation
    -5      !x-min
    5       !x-max
    20      !number of bins
  idcode 120  idcode  -120 !charged pions
  idcode 130  idcode  -130 !charged kaons
  idcode 1120 idcode -1120 !protons and antiprotons
endanalysis


!-------------------------------------------------------
! Write out final results to output file
!-------------------------------------------------------

write "rapidity distribution"
histoweight
writearray 3
```

Define analysis

We first define the *xvariable* as **rap** (rapidity) and *yvariable* as **numptl** (number of particles). The next four numbers define: the normalisation code (*11* means that we perform a normalisation, dividing by the number of events and by the bin width), the rapidity range (from *-5* to *5*) and the number of bins (*20*).

The *idcode* commands define the particles of interest. Please refer to **src/KWt/idt.dt** to get EPOS identifier values. In this example, we only focus on charged pions (π^+, π^-), charged kaons (K^+, K^-), protons and antiprotons ($p, \bar{p}$).

Output

This example will create a rapidity distribution (dN/dy), for charged pions (π^+, π^-), charged kaons (K^+, K^-), protons and antiprotons ($p, \bar{p}$), distributed in 20 bins between y = -5 and y = 5 .

The following commands allow to write out the results in an histogram filename named **${HTO}z-expl1.histo**. The command *write* defines the histogram title (here: *rapidity distribution*). The command *histoweight* prints the histoweight value.

Finally, the command *writearray 3* creates a 3-column table with x, y and y-error values.
The analysis results are written in the file **${HTO}z-expl1.histo**

```
        rapidity distribution
        histoweight 0.30000000000000E+04
        array 3
        -0.4750E+01  0.5120E+00  0.1848E-01
        -0.4250E+01  0.9127E+00  0.2467E-01
        -0.3750E+01  0.1291E+01  0.2933E-01
        -0.3250E+01  0.1499E+01  0.3162E-01
        -0.2750E+01  0.1567E+01  0.3232E-01
        -0.2250E+01  0.1445E+01  0.3103E-01
        -0.1750E+01  0.1397E+01  0.3052E-01
        -0.1250E+01  0.1512E+01  0.3175E-01
        -0.7500E+00  0.2056E+01  0.3702E-01
        -0.2500E+00  0.3845E+01  0.5063E-01
         0.2500E+00  0.3912E+01  0.5107E-01
         0.7500E+00  0.2033E+01  0.3681E-01
         0.1250E+01  0.1497E+01  0.3159E-01
         0.1750E+01  0.1391E+01  0.3045E-01
         0.2250E+01  0.1433E+01  0.3090E-01
         0.2750E+01  0.1526E+01  0.3190E-01
         0.3250E+01  0.1516E+01  0.3179E-01
         0.3750E+01  0.1311E+01  0.2957E-01
         0.4250E+01  0.9440E+00  0.2509E-01
         0.4750E+01  0.5040E+00  0.1833E-01
        endarray
```

We get 20 bins with rapidity values in the range]-5, 5[with a total of 3000 events.
One can then build and display the plot.