Details of Parametrization

We have fitted our non-extensive based, Tsallis-like fragmentation functions (FF) in leading order (LO) to data from ALEPH, SLD, DELPHI and OPAL $e^- + e^+ \to h + X$ spectra at 91.2 GeV. The form of our FF is

$$D_i^h(x,Q) = N_i^h \left[1 - \frac{q_i^h - 1}{T_i^h} \ln(1-x)\right]^{-\frac{1}{q_i^h - 1}}, \tag{1}$$

where h is the outgoing hadron (in our case π^+, π^+ or $(\pi^- + \pi^+)/2$), i is the fragmenting parton $i = u, d, s, c, b$ and g and N, q, T are parameters during fits.

We have created a simple parametrization for users who need x and Q dependence of our fragmentation function similar to method of KKP. We Q-evolved our FFs and then we fitted $N(Q), q(Q)$ and $T(Q)$ with a polynomial

$$N_i^h = a_i^h + b_i^h\,\bar{s} + c_i^h\,\bar{s}^2 + d_i^h\,\bar{s}^3 \tag{2}$$
$$q_i^h = a_i^h + b_i^h\,\bar{s} + c_i^h\,\bar{s}^2 + d_i^h\,\bar{s}^3 \tag{3}$$
$$T_i^h = a_i^h + b_i^h\,\bar{s} + c_i^h\,\bar{s}^2 + d_i^h\,\bar{s}^3. \tag{4}$$

We used the scaling variable scaling

$$\bar{s} = \ln\frac{\ln(Q^2/\Lambda^2)}{\ln(Q_0^2/\Lambda^2)}, \tag{5}$$

where $\Lambda = 0.088$ GeV and the definitions for the initial energy scales are

$$Q_0 = \begin{cases} 1\text{ GeV}, & \text{for } u, d, s, g \\ m_c & \text{for } c \\ m_b & \text{for } b \end{cases}, \tag{6}$$

therefore we used $\bar{s}, \bar{s}_c$ and $\bar{s}_b$. By definition $D_i^h(z, Q < Q_0) \equiv 0$. This simple parametrization works well at 3 GeV $\le Q \le 10^5$ GeV and $x \in (0,1)$.

The `tss.f` FORTRAN code contains the parameterization and `sample.f` helps to use our code.

If you need our FF at smaller or higher Q, or the exact energy evolution by solving DGLAP equations connect us at
`takacs.adam@wigner.mta.hu`
Please don't forget to cite us! :)