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# A study of the energy evolution of event shape distributions and their means with the DELPHI detector at LEP

DELPHI Collaboration

## Abstract

Infrared and collinear safe event shape distributions and their mean values are determined in e+e- collisions at centre-of-mass energies between 45 and 202 GeV. A phenomenological analysis based on power correction models including hadron mass effects for both differential distributions and mean values is presented. Using power corrections,  $\alpha_s$  is extracted from the mean values and shapes. In an alternative approach, renormalisation group invariance (RGI) is used as an explicit constraint, leading to a consistent description of mean values without the need for sizeable power corrections. The QCD  $\beta$ -function is precisely measured using this approach. From the DELPHI data on Thrust, including data from low energy experiments, one yields

$$\beta_0 = 7.86 \pm 0.32$$

for the one loop coefficient of the  $\beta$ -function or, assuming QCD,

$$n_f = 4.75 \pm 0.44$$

for the number of active flavours. These values agree well with the QCD expectation of  $\beta_0 = 7.67$  and  $n_f = 5$ . A direct measurement of the full logarithmic energy slope excludes light gluinos in the open mass range below 5 GeV.

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