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Measurement of the Scaling Property of the Factorial Moments in Hadronic Z Decay

L3 Collaboration

Abstract

Both three- and one-dimensional studies of local multiplicity fluctuations in hadronic Z decay are performed using data of the L3 experiment at LEP. The second-order normalized factorial moment in three dimensions is found to exhibit power-law scaling, indicating that the fluctuations are isotropic. This is confirmed by a detailed study of the corresponding one-dimensional moments. Such scaling corresponds to a self-similar fractal, i.e., the associated branching process is self-similar. However, when two-jet subsamples are analyzed, the branching is found to be self-affine. These features are at least qualitatively reproduced by the Monte Carlo models JETSET and HERWIG.

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