

# Energy-Energy Correlation in the back-to-back region at $N^3LL+NNLO$ in QCD

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We consider the Energy-Energy Correlation function in electron-positron annihilation to hadrons. We concentrate on the back-to-back region, performing all-order resummation of the logarithmically enhanced contributions in QCD perturbation theory, up to next-to-next-to-next-to-leading logarithmic ( $N^3LL$ ) accuracy. Away from the back-to-back region, we consistently combine resummed predictions with the known fixed-order results up to next-to-next-to-leading order (NNLO). All perturbative terms up to order  $\alpha_S^3$  are included in our calculation, which exactly reproduces, after integration over the angular separation variable, the next-to-next-to-next-to-leading order ( $N^3LO$ ) result for the total cross section. We regularize the Landau singularity of the QCD coupling within the so-called Minimal Prescription. We exhibit and discuss the reduction of the perturbative scale dependence of distributions at higher orders, as a means to estimate the corresponding residual perturbative uncertainty. We finally present an illustrative comparison with LEP data.

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