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Higher-order initial state radiation in e^+e^- annihilation

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Radiative corrections due to initial state radiation in electron-positron annihilation are calculated within the QED structure function approach. NLO QED parton distribution functions are derived analytically. Results are shown in the next-to-leading logarithmic approximation up to $\mathcal{O}(\alpha^4 L^3)$ order, where $L = \ln(s/m_e^2)$ is the large logarithm. Several mistakes in previous calculations are corrected. The results are relevant for future high-precision experiments at e^+e^- colliders.

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