INVESTIGATION OF THE DOUBLE PHOTOIONIZATION

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The double photoionization of atoms is studied intensively nowadays. We show that there are three possible mechanisms of the process: shake-off, final state interactions and quasifree one (involving small momentum transferred to the nucleus). Each of the mechanisms dominates in certain part of the spectrum. This leads to nontrivial shape of the energy distribution. The latter changes while we change the value of the photon energy ω. We built the spectrum curves for several values of ω. We show that if the value of ω is large enough the double-to single-ionizations ratio is not constant any more. It increases with ω linearly. The slope is determined by certain characteristic of ground state wave function.

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RESUMMATION OF $(\beta_0\alpha_s)^n$ CORRECTIONS IN QCD: TECHNIQUES AND APPLICATIONS TO THE τ HADRONIC WIDTH AND THE HEAVY QUARK POLE MASS

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We propose to resum exactly any number of one-loop vacuum polarization insertions into the scale of the coupling of lowest order radiative corrections. This makes maximal use of the information contained in one-loop perturbative corrections combined with the one-loop running of the effective coupling and provides a natural extension of the familiar BLM scale-fixing prescription to all orders in the perturbation theory. It is suggested that the remaining radiative corrections should be reduced after resummation. In this paper we implement this resummation by a dispersion technique and indicate a possible generalization to incorporate two-loop evolution. We investigate in some detail higher order perturbative corrections to the τ decay width and the pole mass of a heavy quark. We find that these corrections tend to reduce $\alpha_s(m_\tau)$ determined from τ decays by approximately 10% and increase the difference between the bottom pole and $\overline{\rm MS}$-renormalized mass by 30%.

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