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Two-photon transitions of charmonia on the light front

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We present a parameter-free prediction of the two-photon transitions of the charmonium system $[c\bar{c}] \to \gamma^*\gamma$ in a relativistic light-front formalism. The use of light-front formulation automatically takes into account the large-Q^2 behavior of the process as predicted by pQCD. Furthermore, the relativistic nature of the light-front dynamics provides a reliable access to the decay widths at $Q^2 \to 0$, a short-distance quantity. The light-front wave functions were obtained from solving the effective Hamiltonian based on light-front holography and one-gluon exchange interaction within the basis light-front quantization approach. The same wave functions have been used to compute a wide range of observables, e.g. form factors, decay width, radiative widths, generalized parton distribution functions and cross sections of the diffractive vector meson productions, with reasonable agreements with the experimental measurements whenever available. In this talk, we will present the numerical results of the two-photon transition form factors as well as the two-photon decay widths for S- and P-wave charmonia, η_c and χ_{cJ} and their excitations. Without introducing any free parameters, our results are in good agreement with the recent experimental measurements by BABAR, BES and BELLE, shedding light on the relativistic nature of charmonium.

Reference:
Y. Li, M. Li, J.P. Vary, Phys. Rev. D. **105**, L071901 (2022)

Category

talk

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