

η_c production within light-cone approach in pp and $e^- A$ collisions

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The charmonium state η_c is the heavy pseudoscalar meson ($J^{PC} = 0^{-+}$) lied under $D\bar{D}$ threshold. We will review the proton-proton and $e^- A$ reactions, where η_c can be produced through the two virtual gluons or one virtual photon.

The main ingredient in our light-cone approach is the space-like transition form factor with dependence on two virtualities of the fused particles.

The idea is to construct the form factor on the basis of the wave function of the $c\bar{c}$ state. The radial part of the wave function can be found by solving the Schrödinger equation then “translation” to the light-cone variable is performed using the Terentev prescription.

I will present the effects of the so-obtained form factors in the context of proton-proton collisions by taking into account the proper color factors and coupling constant for the off-shell gluon-gluon transition to the pseudoscalar meson. We have compared our results to LHCb data for the prompt production of η_c at 7 TeV, 8 TeV and 13 TeV c.m. energies.

Future facilities such as EIC or LHeC give the opportunity to probe the form factor dependence on the virtuality in $e^- A$ collisions. I will present results for the photon Q^2 -dependence within the equivalent photon approximation.

Based on the references

I.-Babiarz, V.-P.-Goncalves, R.-Pasechnik, W.-Schäfer and A.-Szczyrek,

“ $\gamma^* \gamma^* \rightarrow \eta_c(1S, 2S)$ transition form factors for spacelike photons”,

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“Prompt hadroproduction of $\eta_c(1S, 2S)$ in the k_T -factorization approach”,

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“Exclusive η_c production in electron-ion collisions”, work in progress

Collaboration

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