Contribution ID: 143

Type: Parallel

## $\eta_c$ production within light-cone approach in pp and $e^-\,A$ collisions

Friday, 23 June 2023 17:30 (20 minutes)

The charmonium state  $\eta_c$  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  $\eta_c$  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  $\eta_c$  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

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## Collaboration

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Session Classification: Parallel session A4