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Diffractive production of \chi_c(0,1,2) mesons at LHC, Tevatron and RHIC

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We calculate several differential distributions for exclusive double diffractive scalar $\chi_c(0^{++})$, axial-vector $\chi_c(1^{++})$ and tensor $\chi_c(2^{++})$ mesons production in the proton-antiproton collisions at Tevatron and in proton-proton collisions at RHIC and LHC. We use the formalism of unintegrated gluon distributions (UGDFs) within the $k_\perp$-factorisation approach. The uncertainties of the Kaidalov-Khoze-Martin-Ryskin approach are discussed. The $g^*g^* \to \chi_c(0,1,2)$ transition vertices are calculated as functions of gluon virtualities via the standard perturbative nonrelativistic QCD (pNRQCD) technique. Different models of UGDFs are used and the results are shown and discussed. The cross section for the diffractive component depends strongly on UGDFs.

The off-shell effects are discussed and quantified. We show that for the $\chi_c(1^{++})$ production the famous Landau-Yang theorem is not applicable in the case of off-shell gluons. The contribution of $\chi_c(1^{++})$ to the $J/\Psi+\gamma$ channel is smaller than that of the $\chi_c(0^{++})$ and $\chi_c(2^{++})$ decays, but not negligible and can be measured. The numerical value of the ratio of the these contributions is almost independent of UGDFs modeling.

We have also calculated differential cross sections for different spin polarizations of $\chi_c(1^{++})$ and $\chi_c(2^{++})$. The integrated cross section for spin polarizations $\lambda = \pm 1$ (for $\chi_c(1^{++})$) and $\lambda = \pm 2$ (for $\chi_c(2^{++})$) is approximately an order of magnitude greater than that for the $\lambda = 0$ polarization.

Primary authors: Prof. SZCZUREK, Antoni (Institute of Nuclear Physics PAN, PL-31-342 Cracow, and University of Rzeszow, PL-35-959 Rzeszow, Poland); Prof. TERYAEV, Oleg (Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna 141980, Russia); Dr PASECHNIK, Roman (Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna 141980, Russia)

Presenter: Dr PASECHNIK, Roman (Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna 141980, Russia)

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