**Charmed quark and meson production   
in collisions of ultrarelativistic protons**

*Horbatiuk T.M.*

*(Supervisor: Kotlyar V.V.)*

**Народження зачарованих кварків та мезонів   
у зіткненнях ультрарелятивістських протонів**

*Горбатюк Т. М.*

*(Науковий керівник: Котляр В.В.)*

Production of c anti-c quark pairs and D-mesons in proton-proton collisions is studied under conditions of the experiments at the Large Hadron Collider at CERN.

Computation of parton processes is carried out with programs obtained with the help of MadGraph5\_aMC@NLO in a model with massive c-quarks. Simulation of p + p → c + anti-c+ X is performed in the leading order (LO) of QCD perturbation theory; at the next-to-leading order (NLO), which includes the processes of real and virtual particle emission; and taking into account NLO and N2LO contributions at the tree level. Parton processes are generated with the LO and NLO parton distribution functions NNPDF 2.3. Space-like and time-like showers are consistently included in the calculations with Pythia 8 event generator. The Lund string model implemented in Pythia 8 is used to describe parton fragmentation. Influence of multi-parton interactions on observables in the meson production is analyzed.

Integral and differential cross sections for the production of c-quarks, D+, D0, D\*+, and Ds+ mesons are calculated and compared with the ALICE and LHCb data.

It is shown that the integral cross section for c-quark production, computed at NLO accuracy, reduces by factor ~45 relatively to the Born one. At the same time, the cross section at NLO and N2LO at the tree level increases in 12% and 19%. Integral and differential cross sections for production of D+, D0, D\*+, and Ds+ mesons are calculated and compared with the ALICE and LHCb data.