

Theoretical study and computer simulation (+ MC development) of hard processes for SPD NICA experiment

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Group members:

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Students: about five (bachelor level degree)

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06.06.2019

SPD-NICA, JINR, Dubna

Hard processes at SPD NICA

SPD NICA: proton-proton collisions, $\sqrt{S} = 24$ GeV, $|y| < 3$, $0 < p_T < 6$ GeV

- ① DY, $q_T \ll Q$, $q_T \sim Q$
- ② Isolated γ production
- ③ Prompt J/ψ production.

Theoretical study

- ① TMD factorization, off-shell effects, gauge invariance in DY pair production, CSS TMD versus PRA
- ② Prompt photon production, LO+NLO CPM versus PRA (Parton Reggeization Approach)
- ③ Spectra and polarization effects in J/ψ production.

Computer simulation

- 1 Theoretical predictions for production rates, polarization parameters, ... in LO+NLO CPM, CSS TMD factorization and PRA.
- 2 Development of software which can be used in SPDR00T for MC simulation.
- 3 Pedagogical task: student's laboratory of computer simulation and data analysis in high-energy physics.

Objectivity

- ① 10 publications in top-level journals (Q1) during last 5 years
- ② Last publications (2019):
 - A. V. Karpishkov, M. A. Nefedov and V. A. Saleev, “Evidence in favor of Single Parton Scattering mechanism in Υ and D associated production at the LHC,” Phys. Rev. D **99** (2019) no.9, 096021.
 - M. Nefedov and V. Saleev, “Off-shell initial state effects, gauge invariance and angular distributions in the DrellYan process,” Phys. Lett. B **790** (2019) 551.
 - A. Karpishkov, V. Saleev and A. Shipilova, “Angular decorrelations in $\gamma + 2jet$ events at high energies in the parton Reggeization approach,” arXiv:1811.06942 [hep-ph]. To be published in Mod. Phys. Lett. A.
- ③ Young team: one assistant professor (32 years old) and two scientists (28 and 26 years old) plus students.
- ④ International cooperation: II Institute for Theoretical Physics Hamburg University (NLO calculations in CPM and PRA)
- ⑤ Cooperation with JINR Laboratories: LTP, LNP and LHEP.