1 - 15 Research Highlight at High Energy Nuclear Physics Group

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Here we give research highlight of theoretical physics and experimental simulation at High Energy Nuclear Physics Group during the year of 2016.

In theoretical hadron physics, we paid special attention to the hadron production and their structures. The $f_0(500)$, $f_0(980)$ and $a_0(980)$ meson productions in the K^-p reaction and $\chi_{c1} \to \eta\pi^+\pi^-$, $\Lambda_c^+ \to \pi^+\eta\Lambda$ decays are systematically explored in the effective model[1,2]. The dynamically generated states $f_2'(1525)$ and $K_2^*(1430)$ are investigated in the photoproduction on proton target[3]. We also studied the high lying isospin-1/2 nucleon resonances with the mass of around 2.0 GeV in the $\pi N \to \eta' N$ reaction and $J/\psi \to p\bar{p}\eta'$ decay[4]. These works were important for our understanding of the component of these hadron states and the results can be tested by future experiments.

In theoretical nuclear physics, a supersymmetric Skyrme model was constructed for the first time without the auxiliary field problem and its properties was deeply studied[5]. The Skyrme model with the addition of two different pion mass terms or with the addition of extra scalar potentials are also considered[6]. The coherent and incoherent cross sections of vector mesons J/ψ, ρ and ϕ in ultraperipheral PbPb collisions are calculated in the dipole model, and the numerical result of the rapidity distributions is compared to the experimental data[7].

In the experimental simulation, the high intensity proton beam in Accelerator Driven System was designed to produce neutrinos with the aim to measure the neutrino oscillation, leptonic CP-violating phase and search for sterile neutrino by using decay at rest of spallation isotopes (IsoDAR) and μDAR[8]. The general design is promoted and the performance is optimized from several aspects. Also, although the uncertainty in the reactor neutrino spectrum is unexpectedly bigger, the precision of θ_{12} can be improved considerably at a medium baseline reactor neutrino experiment by using recent measurements of the reactor neutrino spectrum[9]. These studies are essential for the design of neutrino experiment in future facilities.

References

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