Description of the EMC Effect in the Co-variant Bethe–Salpeter Approach

V.V. Burov[a,b], A. Hosaka[b], A.V. Molochkov[a,b], G.I. Smirnov[a], H. Toki[b]

[a] *Joint Institute for Nuclear Research, Dubna, Russia*
[b] *Research Center for Nuclear Physics, Osaka University, Osaka, 567-0047, Japan*

The EMC effect is studied within the co-variant Bethe-Salpeter approach [1]. The analysis is performed in the kinematical range of Bjorken $0.001 < x < 0.9$. We show that the relativistic approach provides unified understanding of the nuclear shadowing, anti-shadowing and EMC effects as the evidence of the nucleon properties enlightened by the four dimensional structure of the nucleon bound state. Relative time effect the bound nucleons is discussed in connection with explicit dynamical models of the EMC effect and nuclear shadowing. The A dependence of these effects is discussed.
We show that the pattern of the oscillation of the structure functions ratio $r^A(x) = F_2^A/F_2^{\mathrm{N(D)}}$ varies with A by changing the position of the cross-over point x_3 in which $r^A(x) = 1$, unlike the pattern for nuclei with masses $A > 4$, where only the amplitude of the oscillation changes. In particular we find that the pattern of $F_2(x)$ modifications is controlled with the values $(1 - x_3) = 0.32$ (D/N), 0.16 (^{3}He/D) and 0.08 (^{4}He/D). The calculated results show that the experimental data on the ratio of nuclear and deuteron structure functions give precise information about the details of the nucleon structure function.

References

[1] S.G. Bondarenko, V.V. Burov, A.V. Molochkov, G.I. Smirnov, H. Toki, Prog. Part. Nucl. Phys., v. **48**, issue 2 (2002); nucl-th/0203069.