

XXV International Baldin Seminar on High Energy Physics Problems
"Relativistic Nuclear Physics and Quantum Chromodynamics"



XXV International Baldin Seminar
on High Energy Physics Problems
Relativistic Nuclear Physics & Quantum Chromodynamics

September 18 - 23, 2023, Dubna, Russia

Contribution ID: 114

Type: not specified

On the coherent inelastic binary and multiparticle processes in ultrarelativistic hadron-nucleus, photon-nucleus and nucleus-nucleus collisions

Tuesday, 19 September 2023 17:30 (20 minutes)

The coherent inelastic processes of the type $a \rightarrow b$, which may take place in the interaction of hadrons and γ quanta with nuclei at very high energies (the nucleus remains the same), are theoretically investigated. For taking into account the influence of matter inside the nucleus, the optical model based on the concept of refraction index is applied .

Analytical formulas for the effective cross section $\sigma_{\text{coh}}(a \rightarrow b)$ are obtained, taking into account that at ultrarelativistic energies the main contribution into

$\sigma_{\text{coh}}(a \rightarrow b)$

is provided by very small transferred momenta in the vicinity of the minimum longitudinal momentum transferred to the nucleus. It is shown that the cross section $\sigma_{\text{coh}}(a \rightarrow b)$ may be expressed through the "forward" amplitudes of inelastic scattering $f_{a+N \rightarrow b+N}(0)$ and elastic scattering

$f_{a+N \rightarrow a+N}(0), f_{b+N \rightarrow b+N}(0)$

on a separate nucleon, and it depends on the ratios L_a/R and L_b/R , where L_a, L_b are the respective mean free paths in the nucleus matter for the particles a, b and R is the nuclear radius. In doing so, several characteristic cases with different relations of the magnitudes L_a, L_b, R are considered in detail.

The above formalism is generalized also for the case of coherent inelastic multiparticle processes on a nucleus of the type $a \rightarrow \{b_1, b_2, b_3, \dots, b_i\}$ and for the case of coherent processes in collisions of two ultrarelativistic nuclei.

Primary author: LYUBOSHITZ, Valery V. (Joint Institute for Nuclear Research (Dubna))

Presenter: LYUBOSHITZ, Valery V. (Joint Institute for Nuclear Research (Dubna))

Session Classification: Parallel: Relativistic heavy ion collisions