

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



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Tsallis statistics with escort probabilities and transverse momentum distributions of hadrons

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We have derived the exact and approximate transverse momentum distributions for the Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann statistics of particles in the Tsallis statistics with escort probabilities (the Tsallis-3 statistics). The Tsallis-3 statistics is considered by the scientific community to be the most correct. We have found that the classical phenomenological Tsallis distribution in the framework of the Tsallis-3 statistics is questionable as it corresponds to the classical transverse momentum distribution of the Tsallis-3 statistics in the zeroth term approximation for which the entropy of the system is equal to zero for all values of state variables. We have found that the classical and quantum Tsallis-like distributions and the quantum phenomenological Tsallis distributions do not correspond to the transverse momentum distributions of the Tsallis (Tsallis-1, Tsallis-2, Tsallis-3) statistics and q -dual statistics. The exact Maxwell-Boltzmann transverse momentum distribution of the Tsallis-3 statistics and the classical phenomenological Tsallis distribution have been compared and applied to describe the experimental spectra of the charged pions produced in the proton-proton collisions at high energies. We have revealed that the numerical results for the parameters of the classical phenomenological Tsallis distribution deviate from the results of the Tsallis-3 statistics for all values of collision energy.

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