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Cumulative Particle Production in p+A Collisions and z-Scaling

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Experimental data on inclusive charged particle spectra in p+A collisions are analyzed in the framework of z-scaling. The data on cross sections were taken by groups of G.Leksin at FNAL (Batavia), L.Zolin and V.Gapienko at IHEP (Protvino) with nuclear targets from beryllium up to tungsten. Spectra cover a special kinematics known as a cumulative region. Cumulative particles can be only produced in nuclear collisions. Their production is assumed to be sensitive to the state of the nuclear matter formed at the extreme conditions. Theory of z-scaling is developed for analysis of the cumulative processes and search for phase transition effects. The concept of z-scaling is based on principles of self-similarity, locality and fractality of constituent interactions at small scales. The momentum spectrum of the inclusive particle is recalculated to scaling function $\Psi(z)$ which depends on self-similarly parameter z. A microscopic scenario of pA interactions in terms of momentum fractions x1, x2 is discussed. Results of the analysis are compared with the noncumulative data on high-pT hadron production in pA collisions obtained by J.Cronin, R.Sulyaev and D.Jaffe groups. Universality of the shape of function $\Psi(z)$ is used to predict inclusive cross sections of particles produced in the deep-cumulative region.

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