Plenary talk

Nucleon internal structure: a new set of quark, gluon momentum, angular momentum operators and parton distribution functions

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摘要

It is unavoidable to deal with the quark and gluon momentum and angular momentum contributions to the nucleon momentum and spin in the study of nucleon internal structure. However we never have the quark and gluon momentum, orbital angular momentum and gluon spin operators which satisfy both the gauge invariance and the canonical momentum and angular momentum commutation relation. The conflicts between the gauge invariance and canonical quantization requirement of these operators are discussed. A new set of quark and gluon momentum, orbital angular momentum and spin operators, which satisfy both the gauge invariance and canonical momentum and angular momentum commutation relation, are proposed. The key point to achieve such a proper decomposition is to separate the gauge field into the pure gauge and the gauge covariant parts. The same conflicts also exist in QED and quantum mechanics and have been solved in the same manner. The impacts of this new decomposition to the nucleon internal structure are discussed.

关键词   nucleon internal structure, quark-gluon momentum and angular momentum, canonical commutation relation, gauge invariance

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