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Full renormalization of observables via the Principle of Observable Effective Matching

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In this talk, we present a novel approach to fully renormalize observables such as theoretical predictions for cross sections and decay rates in particle physics. While renormalization techniques have been utilized to absorb infinities, the theoretical expressions for observables are still not fully renormlazed as they contain dependence on arbitrary subtraction schemes and scales. We resolve this to achieve full renormalization based on a new principle termed as the Principle of Observable Effective Matching (POEM) to simultaneously gain both scale and scheme independence. We illustrate this with an example of the total cross section of the electron positron to hadrons whereby we utilize 3- and 4-loop MS scheme expressions via perturbative Quantum Chromodynamics (pQCD). With POEM and a process termed as Effective Dynamical Renormalization,we fully renormalize these expressions. We obtain prediction of 1.052431+0.0006−0.0006 at Q=31.6GeV, which is in excellent agreement with the experimental value of Rexpe+e−=1.0527+0.005−0.005.

Keyword-1

Quantum Field Theory

Keyword-2

Renormalization

Keyword-3

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