

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



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on High Energy Physics Problems
Relativistic Nuclear Physics & Quantum Chromodynamics
September 18 - 23, 2023, Dubna, Russia

Contribution ID: 119

Type: **not specified**

Strong-coupling extrapolation of Gell-Mann-Low functions

Thursday, 21 September 2023 12:00 (20 minutes)

Gell-Mann-Low functions in quantum field theory are usually defined as asymptotic expansions over a small coupling. However their behavior at large coupling is of principal interest, since this behavior sheds light on the general properties of the coupling parameter as a function of a scale variable. We developed an approach, called self-similar approximation theory, allowing for the extrapolation of asymptotic expansions over a small variable to finite and even infinite values of the variable. The approach is illustrated by several examples demonstrating the convergence of the found strong-coupling exponent to exactly known values. Then the self-similar extrapolation is applied for finding out strong-coupling exponents of perturbative expansions over asymptotically weak coupling for the Gell-Mann-Low functions of multicomponent scalar field theory, quantum electrodynamics, and quantum chromodynamics.

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Session Classification: Parallel: Quantum chromodynamics at large distances