



Πανεπιστήμιο Κύπρου
Τμήμα Φυσικής

Το Τμήμα Φυσικής του Πανεπιστημίου Κύπρου
σας προσκαλεί την

Δευτέρα, 20 Μαΐου 2024, ώρα 10:00
στην αίθουσα B229, στο κτίριο 13 στην Πανεπιστημιούπολη

στην παρουσίαση της Διδακτορικής Διατριβής του Δημητρίου Γαβριήλ

“Perturbative calculation of fundamental QCD quantities”

This dissertation presents a series of perturbative calculations in two main projects concerning fundamental quantities in Quantum Chromodynamics (QCD). The majority of the calculations are conducted within the framework of lattice field theory, using a range of improved lattice actions commonly used in numerical simulations.

Initially, the perturbative results of the discretization errors, which are proportional to the quark mass ($O(am)$), are calculated on the QCD running coupling within lattice perturbation theory. The analysis involves the calculation of the 2-loop renormalization factor Z_g using improved lattice actions for an arbitrary representation of the $SU(N_c)$ gauge group and N_f multiplets of fermions with a finite quark mass respecting the $O(am)$ improvement. The background field method is employed to compute Z_g by evaluating quantum corrections on both the background and quantum gluon propagator. This allows the perturbative evaluation of the $O(am)$ lattice errors arising from the finite quark mass. The elimination of these $O(am)$ effects is crucial for the nonperturbative studies of precision determinations of the strong coupling constant using lattice field theory.

Furthermore, the renormalization of a complete set of gauge-invariant gluon nonlocal operators in lattice perturbation theory is investigated. The mixing pattern under renormalization of these operators is determined using symmetry arguments, which extend beyond perturbation theory. Additionally, the renormalization factors of the operators within the modified Minimal Subtraction (\overline{MS}) scheme are derived up to one-loop, along with the conversion factors from the modified regularization invariant RI' scheme to \overline{MS} . The computations are performed by employing both dimensional and lattice regularizations, using the Wilson gluon action. This work is relevant to nonperturbative studies of the gluon parton distribution functions (PDFs) on the lattice.

Η παρουσίαση θα είναι ανοικτή στο κοινό.

Για περισσότερες πληροφορίες παρακαλώ επικοινωνείτε: Τμήμα Φυσικής, τηλέφωνο: 22892820