



Πανεπιστήμιο Κύπρου
Τμήμα Φυσικής

Το Τμήμα Φυσικής του Πανεπιστημίου Κύπρου
σας προσκαλεί την

Δευτέρα, 20 Μαΐου 2024, ώρα 11:30
στην αίθουσα B229, στο κτίριο 13 στην Πανεπιστημιούπολη

στην παρουσίαση της Διδακτορικής Διατριβής του Ηρόδοτου Ηροδότου

“Supersymmetric QCD on a Spacetime Lattice”

In this thesis, we present two projects: Fine-Tuning of the Yukawa and Quartic Couplings in Supersymmetric QCD and Gauge-invariant Renormalization of Four- quark Operators in Lattice QCD.

Supersymmetric models applied to strongly interacting systems offer exciting prospects for uncovering new physics beyond the Standard Model. In recent years, numerical lattice studies of supersymmetric extensions of QCD have become more attainable. There are numerous motivations to delve into the study of supersymmetric theories using lattice techniques. Nevertheless, various well-known obstacles emerge from the breaking of supersymmetry in a lattice-regulated theory, such as the requirement for fine-tuning of the theory's bare Lagrangian. Our approach to address these issues involves mandating that all symmetries of the action, which are broken on the lattice, must be fully restored as the continuum limit is approached. For the first project, we investigate the fine-tuning of the Yukawa (gluino-quark-squark interactions) and quartic (four-squark interactions) couplings of $N = 1$ supersymmetric QCD, discretized on a Euclidean lattice. The Modified Minimal Subtraction Scheme ($MSbar$) is employed; by its definition, this scheme requires perturbative calculations, in the continuum and/or on the lattice.

For the second project, we perform calculations to determine the renormalization of the four-quark operators in the framework of QCD. We employ a Gauge Invariant Renormalization Scheme (GIRS), which can be advantageous compared to other schemes, and the $MSbar$ Scheme. From our perturbative computations we extract the elements of the conversion matrices between these two renormalization schemes at the next leading order. A formidable issue in the study of the four-quark operators is the fact that operators with different Dirac matrices mix among themselves upon renormalization. Note that we focus on both Parity Conserving and Parity Violating four-quark operators with $\Delta F=2$.

Η παρουσίαση θα είναι ανοικτή στο κοινό.

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