Πανεπιστήμιο Κύπρου

ΤΜΗΜΑ ΦΥΣΙΚΗΣ

Το Τμήμα Φυσικής του Πανεπιστημίου Κύπρου
σας προσκαλεί την

Πέμπτη, 9 Μαΐου 2019, ώρα 16:00
στην αίθουσα Β228, στο κτίριο 13 στην Πανεπιστημιούπολη

στην παρουσίαση της Διδακτορικής Διατριβής του Γρηγόρη Σπανούδη

"Perturbative renormalization of hadron operators and other fundamental quantities in Lattice Quantum Chromodynamics"

A number of perturbative calculations regarding the renormalization of several local and nonlocal operators (related to studies of hadron structure), as well as the renormalization of other fundamental quantities of QCD (such as the strong running coupling), are presented. Most of our computations have been performed in the context of Lattice Field Theory employing a large family of improved lattice actions, which are currently used in numerical simulations by major international groups (e.g. ETMC, QCDSF, Wuppertal-Budapest Collaboration). The calculations are the following:

1) The one-loop study of renormalization and mixing of nonlocal straight Wilson-line operators in dimensional regularization and in the presence of nonzero quark masses. These operators are relevant to a novel and very promising approach for calculating parton distribution functions on the lattice.

2) The one-loop calculation of the renormalization factors and mixing coefficients of nonlocal staple-shaped Wilson-line operators, in both continuum (dimensional regularization) and lattice regularizations (Wilson/clover fermions and Symanzik-improved gluons). Our work is relevant to the nonperturbative investigations of transverse momentum-dependent distribution functions on the lattice.

3) The extension of our perturbative study to general Wilson-line lattice operators with an arbitrary number of cusps.

4) The ongoing study of higher-loop contributions to the conversion factors between the RI' and $\overline{MS}$ schemes for the straight Wilson-line operators.

5) The two-loop computation of the difference between the renormalization factors of flavor singlet and nonsinglet bilinear quark operators, using Symanzik-improved gluons and staggered fermions with twice stout-smeared links. Our results can be combined with nonperturbative data in order to estimate the renormalization factors for the singlet operators.

6) The ongoing calculation of the three-loop coefficient of the lattice β-function, using Symanzik-improved gluons and stout-smeared fermions. Our results can be combined with extensive simulations in order to make contact with the renormalized coupling in the "Wilson flow" renormalization scheme, which is being very actively investigated by a number of groups at present.