Organisé conjointement par
CPHT-École Polytechnique et Groupe Théorie IPN Orsay

SÉMINAIRE de PHYSIQUE des PARTICULES

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Small parameters in infrared QCD

Résumé :
Lattice simulations show that the running coupling constants obtained through QCD vertices differ in the infrared even though their bare values coincide. For instance, at low momenta the strength of the quark-gluon coupling is about twice the ghost-gluon coupling. None of them diverge in the infrared as it is predicted by standard perturbation theory. Moreover, the ghost-gluon coupling remains moderate even in the infrared. This observation motivates the use of perturbation theory in the ghost-gluon sector in the frame of a massive deformation of QCD Lagrangian in Landau gauge. However, perturbation theory in the quark sector within this massive Lagrangian doesn´t bring as good results as in the pure Yang-Mills case, as should be expected from the larger value of the quark-gluon coupling constant.

We propose a controlled systematic expansion in full QCD based in two small parameters: first the Yang.Mills sector couplings and second the inverse of the number of colors (large-Nc limit). The second approximation relies on the fact that the general features of QCD can be observed in the large-Nc limit. This systematic expansion allows us to properly introduced the use of the renormalization group for the rainbow resummation.

At leading order, this double expansion leads to the well-known rainbow approximation for the quark propagator whose solution shows spontaneous chiral symmetry breaking for sufficiently large quark-gluon coupling constant.

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11:00

Salle de conférences, bât. 6