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

SÉMINAIRE de PHYSIQUE des PARTICULES

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Anatomy of (another) composite Higgs model

Résumé :
Composite Higgs models remain an appealing possibility to avoid the presence of a light fundamental scalar boson in the EWSB sector. In these models, the Brout-Englert-Higgs boson is a composite Nambu-Goldstone boson, arising from the spontaneous breaking, towards a subgroup H, of a global symmetry group G of a hyper-colour gauge theory that confines at the multi-TeV scale. The EW symmetry group is contained in H, and is thus preserved. EWSB arises through vacuum misalignment, triggered by explicit symmetry-breaking effects, thus allowing to decouple the EW breaking scale from the dynamical scale of the hyper-colour interactions.

The seminar is devoted to an in-depth study of a model based on a Sp(2N) hyper-colour gauge group, consisting of two sectors. The EW sector, described by four Weyl fermions in the (pseudo-real) fundamental representation of the Sp(2N) gauge group, is based on the SU(4)/Sp(4) symmetry-breaking pattern. In order to eventually endow the SM fermions with masses via partial compositeness, a second sector, with six Weyl fermions in the (real) anti-symmetric representation of Sp(2N), is introduced. The corresponding symmetry-breaking pattern corresponds to the SU(6)/SO(6) coset. The mass spectrum of this theory and the couplings of the various mesonic states to the currents of the global SU(4)xSU(6) symmetry group are computed within an approximate dynamical framework based on a generalization of the NJL description of the QCD gauge dynamics. The non-trivial features arising from the interplay between the two sectors, linked through an effective operator which incorporates the effects of the gauge anomalies of the axial singlet currents, are analyzed in detail.

Jeudi 3 Novembre 2016

11:00

Salle A201