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Particle Physics in Paris

Mardi 8 Décembre 2020, 16 :00
IHP, Seminar via zoom https ://ijclab.zoom.us/j/94900481972
Domaines : astro-ph—hep-ph—hep-th

Titre : *Is the Higgs boson composite ?*

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Résumé : *In the Standard Model of particle physics, a condensate of the Higgs boson determines the range of the weak nuclear force. However, one finds that quantum corrections generically shift this range to a much smaller value than what is observed. This "hierarchy problem" can be solved by postulating that the Higgs boson is a composite particle, made up of constituents which are tightly bound by a new force. Such a framework necessitates that the closely related top quark is also composite. After briefly discussing the modeling of such a mechanism, I will describe in more detail how we can test this idea in a wide variety of experiments. These signals of Higgs/top compositeness include direct production of the associated new, heavy composite particles at the LHC, as well as modifications of the properties of the Higgs boson and the top quark themselves due to their composite nature. In this model, the idea of grand unification of the fundamental forces works very well and also naturally leads to an exotic particle that may be the dark matter of the universe. Such ambient dark matter can be detected and also produced at colliders in distinctive ways. I will highlight how some of this phenomenological work has triggered the development of novel experimental strategies, which have subsequently found applicability even beyond testing this framework. Time permitting, I will also briefly discuss the cosmological transition from the phase where the relevant degrees of freedom are the constituents of the Higgs boson to the one with bound states.*