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## Rethinking Brout-Englert-Higgs Physics

*Saturday 22 April 2017 09:40 (30 minutes)*

The discovery of the Higgs physics together with the excellent performance of the LHC allow to make precision tests of Brout-Englert-Higgs Physics.

At this level, it becomes important to fully understand the theory behind this physics. As was pointed over the last decades, there are many subtleties which can have far-reaching consequences.

In this talk, I will point out a few examples of these subtleties, and how they affect our understanding of the standard model and new physics. In particular, I will discuss options how to test them in experiment:

- 1) Even without the Higgs QCD would provide masses to the W and Z bosons, just too small ones. The current experimental precision becomes good enough to detect this effect, and will invite similar problems as the muonic  $g-2$ .
- 2) Non-trivial effects potentially alter the high-energy behavior of the Higgs sector and may resolve many issues of the standard model without new physics. Precision measurements of running couplings will be the key to distinguish scenarios.
- 3) While a convenient picture, the idea of breaking the electroweak symmetry is on a fundamental level inadequate. For experiments so far this had little consequences, and we understand why this is the case. However, with the current precision we become sensitive to deviations. It will be shown how this could manifest in heavy-quark production at the LHC and next-generation lepton colliders. Moreover, in theories beyond the standard model this can have far-reaching consequences for the observable particle spectra.

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