The bound state spectrum of Brout-Englert-Higgs theories

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Abstract

The physical, observable spectrum in gauge theories is made up from gauge-invariant states. In QCD, confinement takes care of this issue while a gauge-invariant description of the spectrum in the weak sector is far from obvious. We demonstrate how the bound state spectrum can be mapped to the properties of the gauge-variant elementary fields in the electroweak sector of the standard model via the FMS mechanism. In theories with a more general gauge group and Higgs sector this is no longer necessarily the case. We classify and predict the physical spectrum for a wide range of such theories, with special emphasis on GUT-like models, and show that discrepancies between the spectrum of elementary fields and physical particles frequently arise. In order to check these nontrivial predictions an inherently nonperturbative method is required. We demonstrate how the functional RG can complement and further substantiate these results to obtain a comprehensive picture of the IR spectrum of Brout-Englert-Higgs theories.

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