



Contribution ID: 12

Type: not specified

Higgs-nucleons coupling and the Direct Search for Dark Matter

Thursday 5 December 2019 15:00 (20 minutes)

At tree-level the Higgs boson couplings with quarks through the Yukawa couples, which turn out to be quite small for the light valence quarks of the nucleons. We show that the effective Higgs-nucleon coupling can be described with a Dyson-Schwinger (DS) type equation, in analogy with the equations obeyed by the quark mass. There, the strong QCD effects can induce the generation of a dynamical quark mass even in the limit $m_q \rightarrow 0$; similar effects can also induce an enhancement for the Higgs-nucleon coupling. One important application of this result is for dark matter (χ) direct search, where one looks for the collision of dark matter with nucleons $\chi N \rightarrow \chi N$. In many models such scattering amplitude is mediated by the Higgs boson, and in some cases it could even be the most important one. We analyze the cross section of the process $\chi N \rightarrow \chi N$ within the dark matter-Higgs portal scenario using the DS ansatz (DSa), and then compare our results with those obtained using the Form factor Technique. We find that DSa provides a convenient parametrization to analyze the Higgs-nucleon coupling, which takes into account the low- p^2 effects.

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