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How to fit PDFs in the presence of new physics?

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The interpretation of hadron collider, such as the LHC, data, and the assessment of possible hints of new physics, require the precise knowledge of the proton structure in terms of parton distribution functions (PDFs). In this talk, I present a systematic methodology designed to determine whether and how global PDF fits might inadvertently 'fit away' signs of new physics, described by Effective Field Theory (EFT) corrections, in the high-energy tails of the distributions. I showcase a scenario for the High-Luminosity LHC, in which the PDFs may completely absorb such signs of new physics, thus biasing theoretical predictions and interpretations. I present strategies to single out the effects in this scenario and disentangle the inconsistencies that stem from them. A first solution I discuss is the exploration of the synergy between the high luminosity programme at the LHC and present and future low-energy measurements of large-sea quark distributions. A second one, is to fit simultaneously the PDFs and the new physics signals using the SMEFT framework, which can be done with our publicly released open-source tool SIMUnet.

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