Contribution ID: **13** Type: **Interpretation studies**

Setting limits on Effective Field Theories: the case of Dark Matter

Wednesday, 18 October 2017 14:00 (20 minutes)

The usage of Effective Field Theories (EFT) for LHC new physics searches is receiving increasing attention. It is thus important to clarify all the aspects related with the applicability of the EFT formalism in the LHC environment, where the large available energy can produce reactions that overcome the maximal range of validity, i.e. the cutoff, of the theory. We show that this does not forbid to set rigorous limits on the EFT parameter space through a modified version of the ordinary binned likelihood hypothesis test, which we design and validate. Our limit-setting strategy can be carried on in its full-fledged form by the LHC experimental collaborations, or performed externally to the collaborations, through the Simplified Likelihood approach, by relying on certain approximations. We apply it to the recent CMS mono-jet analysis and derive limits on a Dark Matter (DM) EFT model. DM is selected as a case study because the limited reach on the DM production EFT Wilson coefficient and the structure of the theory suggests that the cutoff might be dangerously low, well within the LHC reach. However our strategy can also be applied, if needed, to EFT's parametrising the indirect effects of heavy new physics in the Electroweak and Higgs sectors.

Presentation

Talk given in person

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