



LABORATORY FOR ELEMENTARY-PARTICLE
PHYSICS (LEPP)

Theory Seminar

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DESY

The Tower of Effective Field Theories for Dark Matter Direct Detection



The existence of Dark Matter (DM) is observationally well established due to its gravitational interactions. If, in addition, DM is a particle which has interactions with the SM, complementarity (i.e. direct, indirect, and collider searches together) will play a crucial role in identifying its putative particle nature and perhaps in unraveling the underlying model. However, complementarity between different search strategies also entails the comparison of experimental results obtained at different energy scales. Further, in direct detection, which is the topic of this talk, the scale of interaction between the DM and atomic nuclei is widely separated from the scales of the DM model itself in a large class of models.

In this talk, I will describe our work to write down a consistent tower of effective field theories (EFTs) to connect all relevant intervening energy scales down to the nuclear scale. In particular, I will discuss the role of meson exchanges and operator mixing due to renormalization group running above the electroweak scale and will show a few examples to illustrate their effect on direct detection scattering rates which can be sizeable. Finally, I will present a Mathematica and python package 'DirectDM' which performs all the required matching and running automatically.

Wednesday, September 25, 2019

2:00pm

401 Physical Sciences Building