Seminarium Studium Doktoranckiego NCBJ

Thursday, 10 December, 9:00

<https://www.gotomeet.me/NCBJmeetings/phd-seminar>

Speaker:

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Title:

Electromagnetic transition form factors and Dalitz decays of hyperons

Abstract:

This project aims to gain information about the hyperon structure through the study of Dalitz decays of a hyperon resonance to a ground-state hyperon and an electron-positron pair. The usual framework of fixed target experiments, albeit very suitable for nucleons, is not as effective for hyperon resonances. One should consequently change the explored kinematical region, from space-like to time-like $q^2$, with the aid of crossing symmetry.

After parametrizing the corresponding baryon-photon-baryon vertex through the use of electromagnetic transition form factors, we formulate double differential decay rates for different spin-parity combinations of the initial state resonance ($J^P = \frac{1}{2}^\pm, \frac{3}{2}^\pm$) transitioning to a ground-state hyperon ($J^P = \frac{1}{2}^+$). Such decay rates are then computed at $q^2=0$ (``QED-type'' approximation) and compared to the original quantities where a ``radius'' structure has been implemented through a low-energy approximation of the form factors. This parallelism can give a rough estimate for the measurement accuracy needed to distinguish between a structure-less and a composite hyperon, namely the minimum requirements for the hyperon internal structure to be ``seen''.

Further information on electromagnetic transition form factors can be acquired through the self-analyzing weak decay of the ground-state hyperon: computing the respective multi-differential four-body decay width results in an additional term containing a relative phase between combinations of the original form factors.