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Muon induced deuteron disintegration in three-dimensions

Saturday, 31 May 2014 15:00 (2:00)

Collaboration

Abstract content

We will present a three-dimensional (3D) description of muon induced deuteron disintegration. This reaction is treated as the decay of the muonic atom with the muon initially on the lowest K shell. Our aim is to calculate the total and differential decay rates. We work in momentum space and use 3D momentum eigenstates directly. This approach allowed us to calculate the appropriate nuclear matrix elements, necessary building blocks for the differential decay rate, in a single step. For contrast - in classical calculations many partial-waves have to be taken into account. We achieved a very good agreement between the 3D and partial-wave methods for calculations that involve single-nucleon currents. Our result for the total decay rate is also in agreement with experimental values, though these are not very precise. This success motivates us to also include two-nucleon current contributions that include the meson exchange currents. Additionally, our formalism can also be applied to other, so far poorly described, processes like: $\mu+{}^3\mathrm{He} \rightarrow \nu+\mathrm{n}+\mathrm{d}$ or $\mu+{}^3\mathrm{He} \rightarrow \nu+\mathrm{n}+\mathrm{n}+\mathrm{p}$.

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