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Is the nuclear emulsion still considered as an effective detector in cosmic ray and high energy physics?

Abstract content

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It is well known that the nuclear emulsion was used effectively long time ago in the field of cosmic rays and high energy physics. It was of great importance in studying the interaction of heavy nuclei with elementary particles, in the period from 1960 until the beginning of the 1990's. Due to the great progress in using the accelerators, consequently the improvement in the detectors techniques, and the interest of scientists to have fast and high statistics for manipulating the results, many research groups around the world ceased the usage of nuclear emulsions as detectors and targets in high energy and cosmic ray physics. On the other hand, scientists shed the light on other new phenomenon as the flow of nuclear matter, proton backward emission, and the emission of short mean free path fragments. In order to study these phenomena, this implies the reuse of the previously studied emulsion plates. This will save time, money, and effort.

In This article, we reshed the light on the phenomenon of short mean free path [1], after the interest in studying the exotic nuclei (nuclei far from stability, which contain extra neutrons than the usual). On studying the charge and the momentum of the emitted particles from ${}^6\text{Li}$ and ${}^7\text{Li}$ nuclei with emulsions at high energies, we succeeded to determine the masses of the omitted nuclei; consequently we found some exotic nuclei (${}^6\text{He}$) produced. The presence of ${}^6\text{He}$ exotic nuclei together with the other He nuclei will shorten the mean free path of Helium. This reveals the importance of nuclear emulsion as an effective detector.

Reference

1- Search for Anomalous fragments in 1.8 A GeV ${}^{40}\text{Ar}$ reactions in nuclear emulsion. R. Bhanja et al., Phys. Rev. Lett. 54, 771 (1985).

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

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