A NEW METHOD FOR CLUSTER DISTRIBUTION ANALYSIS IN HEAVY ION TRACKS

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Cluster analysis is an important computation technique for revealing the hidden patterns in any data sets. In microdosimetry this technique is widely used for studying the ability of different charged particles to produce clusters of ionizations in a given object. This task is most important for investigation of radiation damage to biological targets like macromolecules, cells, and tissues.

In this study we propose the improved calculation method for the cluster analysis of tracks produced by high-Z particles with different energies. The developed technique allows processing of particle tracks containing large number of ionization events automatically without setting the input parameters related to number of clusters and series of cluster centers. The algorithm has been applied for calculation of frequency distribution of clusters with sizes near to the scale of biological structures sensitive to ionizing radiation. A comparative analysis was performed for protons, helium, carbon, and iron ions of energies between 0.1 GeV/nucleon and 1 GeV/nucleon.