

Unique approach for precise determination of binding energies of hypertriton and other hypernuclei with nuclear emulsion and machine learning

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The overall scanning method of the entire volume of the nuclear emulsion irradiated in the E07 experiment at J-PARC can provide to discover events that were not observed by the already-completed analyses with the emulsion-counter-hybrid method. Therefore, further analysis with the overall scanning technique can be used to observe a large number of single- Λ hypernuclei, however, it requires large human loads in visual inspections by optical microscopes for analyzing the big data from the nuclear emulsions. We have developed analysis methods employing the machine learning in order to reduce significantly the human load, and it enables to analyze the events for Λ hypernuclei. We are currently working for searching and analyzing events associated with the production and the stopped two-body decay of the hypertriton in order to determine its binding energy at the world-best precision. The analysis of the E07 nuclear emulsion with the overall scanning will also be extended to study a large number of single- and double-strangeness hypernuclei. Details of the on-going project and its perspective will be discussed.

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