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Cluster states in ^{14}C and ^{15}C studied with the $^{10}\text{Be}+^9\text{Be}$ reactions

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In this contribution, a brief analysis will be given of an experiment performed at LNS-INFN (July 2018) with a 54 MeV ^{10}Be beam and a ^9Be target. The $^{10}\text{Be}+^9\text{Be}$ reactions are measured to get information on different types of structures of several light nuclei. Special attention is given to a search for cluster states in ^{14}C and ^{15}C . The ^9Be isotope has been chosen as the experimental target because of the existence of a cluster structure $^5\text{He}+^4\text{He}$ inside its ground state. Such target structure, alongside the choice of the ^{10}Be radioactive beam with a suitable energy of 54 MeV, means that the transfer of one of the aforementioned clusters from the target to the beam should result in the creation of the sought ^{14}C or ^{15}C isotopes. This should be followed by sequential decay into several channels, some of which are $^4\text{He} + ^{10}\text{Be}$ for ^{14}C and $^4\text{He} + ^{11}\text{Be}$ or $^6\text{He} + ^9\text{Be}$ for ^{15}C . If we manage to see the experimental signature of these processes, this would be the first indication of the existence of cluster states inside the ^{15}C nucleus, while a positive result for the ^{14}C isotope would help to clear up the contradicting findings of other authors.

The experimental setup consists of four highly segmented telescopes covering polar angles from 20° to 90° which enable particle identification using traditional ΔE -E techniques. E part of the telescope is a double-sided silicon strip detector divided into 16 strips at each side, while the ΔE part is one-sided with 16 strips.

Preliminary results for the reaction channels of interest will be shown. Plans for the remaining analysis will also be included.

Topic

Experiment

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