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Cluster states in 14C and 15C studied with the 10Be+9Be 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 ^{9}Be target. The ^{10}Be+^{9}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 ^{9}Be isotope has been chosen as the experimental target because of the existence of a cluster structure ^{5}He+^{4}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}He + ^{10}Be for ^{14}C and ^{4}He + ^{11}Be or ^{6}He + ^{9}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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