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The production of trineutron states after stopped pion absorption by ^9Be nuclei

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The search for the trineutron ^3n was carried out in the reactions of stopped pion absorption $^9\text{Be}(\pi^-, d^4\text{He})^3n$ and $^9\text{Be}(\pi^-, t^3\text{He})^3n$. Correlation measurements of the missing mass spectra were performed using the multilayer semiconductor spectrometer (M. G. Gornov et al., Nucl. Instrum. Methods Phys. Res. A, 446, 461 (2000)). No indications of the existence of bound states of the trineutron were obtained in the measurements of both reactions. Near the threshold ($E_r \geq 0\text{MeV}$), an excess of the experimental spectrum over the calculated one was observed. However, the insufficient statistics of the data in this region did not allow the determination of the resonance parameters of this excess. In both reactions, indications were obtained of the existence of two relatively narrow ($\Gamma \cong 3\text{MeV}$) resonance states with $E_r \cong 6$ and 14 MeV. Several theoretical works [F. M. Marqués and J. Carbonell, EPJA, 57, 105 (2021)] predict the existence of such high lying ^3n states with significantly larger widths ($\Gamma \sim 10\text{MeV}$).

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