DOUBLE FINAL STATE INTERACTION IN 4-BODY DECAYS OF LIGHT NUCLEI

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The four-body breakup of ^{10}B, ^{14}N and ^{12}C induced by 18 MeV neutrons has been studied in nuclear emulsions. A usefull method for representation of such processes is to group particles in pairs and represent the data in the E_{12} vs E_{34} diagram, E_{ij} being the relative energy of the ij system. Although the phase space is not homogenous, two particle final states can be identified as enhancements of events along bands parallel to the axes, and the intersection of two bands is the locus of the simultaneous breakup into two particles subsequently decaying in 4 final particles. The triangle diagram for the four-body breakup $^{10}B(n,n')2\alpha d$ is shown in Fig.1 in the representation E^x_{5He} vs E^x_{6Li}. The enhancement of events along the $^5He_{gs}$ band at loci corresponding to the 2.18, 4.6 and possibly 6.0 MeV levels of ^6Li strongly suggests the presence of the double final state interaction (DFSI) α- n and α- d, i.e. the decay $n+^{14}N \rightarrow {}^5He(\alpha n)+{}^6Li(\alpha d)$. A similar analysis has been performed for the reaction $^{14}N(n,t)3\alpha$.[1]

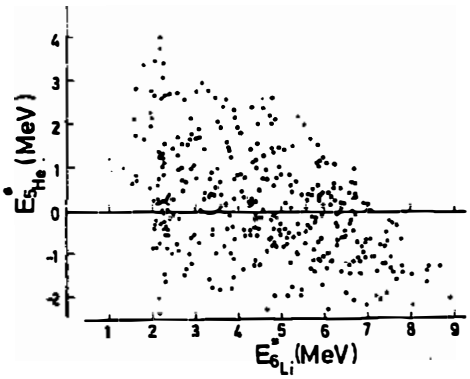

Fig. 1

In Fig. 2 the projection of the points from the ground state band of ^8Be onto the E^x_{7Li} axis shows a peak at 4.67 MeV, rising well above the phase space distribution (dotted line). We conclude that the DFSI $n+^{14}N \rightarrow {}^8Be_{gs}\ (2\alpha)+{}^7Li_{4.6}\ (\alpha,t)$ is one mode of the 4-body decay of ^{14}N. No DFSI was found in the reaction $^{12}C(n,n')3\alpha$.[2]

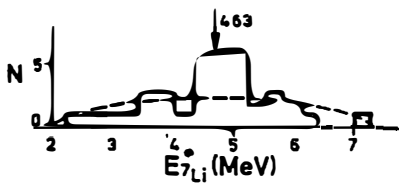

Fig. 2

References:

1. M. Turk, B. Antolković, D.Winterhalter, Nucl. Phys. A270 (1976) 381
2. B. Antolković, Fizika 8 (1976) 163