Final state interactions in the ηd system

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The η-deuteron scattering amplitude is calculated with a K-matrix model of ηN interactions. The existence of a virtual state in the η-deuteron system is inferred. This state couples strongly to the unobserved ηd channel. On the other hand its effect on final state interactions in the $pn \to \eta d$ reaction is rather weak. This happens as a result of two scales involved in this process: (1) the η formation process involves large momentum transfer and short range in space (2) the final state interactions involve large deutron radius. A proper description of the dynamic deuteron formation in this high energy collision is essential.

The final state interactions may be split into three regions : (1) For η energies less than 3 MeV the η-d virtual state dominates these interactions. (2) At about 10 MeV a shallow minimum in the production amplitude occurs due to an interference of free and interacting waves. (3) At higher energies the N*(1535) shape becomes visible.

It is shown that the experimental data [1] allow fairly large ηN scattering lengths [2]. The latter indicate rich spectroscopy in η-nucleus systems.

1. H.Calen et al., Phys.Rev.Lett. 80(1998)2069
2. S.Wycech and A.M.Green, Nucl.Phys.A663,A664,529c(2000)