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Incoming wave bondary conditions in sub-barrier heavy ion fusion reactions

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We analyze sub-barrier heavy ion fusion reactions based on the coupled-channels description with the correct incoming wave boundary conditions, implemented by means of the finite element method. With the aid of the Woods-Saxon potential
the experimental cross sections and the so-called S factors of these reactions are remarkably well reproduced within the sudden approximation approach with the correct incoming wave boundary conditions. We found that accounting for the nondiagonal matrix elements of the coupling matrix, traditionally neglected in the conventional coupled-channels approaches in setting the entangled left boundary conditions inside the potential pocket, and its minimal value are crucially important for the interpretation of experimental data.

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