Optical Theorem Formulation of Low Energy Nuclear Reaction

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Optical theorem formulation of low-energy nuclear reaction [1,2] will be described for 2-body and 3-body reactions. Analytical formulae obtained for the cross-section \( \sigma(E) \) exhibit explicitly the energy and charge dependences of \( \sigma(E) \) and may provide a better physical understanding of anomalous low-energy enhancement of \( \sigma(E) \) observed in deuterated metals [3,4] and also in nuclear fusion reactions relevant for the primodal nucleosynthesis and stellar evolution. Application to 3D fusion observed by Kasagi et al. [5] (“Kasagi effect”) will be described. Effects of halo nuclear states on the anomalous low-energy enhancement of \( \sigma(E) \) are also discussed. The formulation can also be applied to sub-barrier heavy-ion fusion reactions.