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Examination of positive Q-value multi-neutron transfer channel couplings on fusion barrier distribution for the ^{28}Si+^{154}Sm system

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{\large \bf Examination of positive Q-value multi-neutron transfer channel couplings on fusion barrier distribution for the $^{28}$Si+$^{154}$Sm system}
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% insert the authors here. The presenter is underlined
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It is well established that the interplay between nuclear structure and reaction dynamics can lead to enhancement of sub-barrier fusion cross sections, when compared with single-barrier predictions [1]. However, the role of neutron transfer in heavy-ion fusion is still not well understood. Systems like ^{40}Ca + ^{124,132}Sn [2], and ^{28}Si + ^{124}Sn [3] show effects on the enhancement, and on the related barrier distributions, due to the presence of positive Q-value neutron-transfer channels. But fusion in systems such as ^{58,64}Ni + ^{124,132}Sn, despite the presence of positive Q-value channels, do not show such a correlation [4]. Recently, it has been reported that couplings to positive Q-value neutron transfer channels are important if they lead to a change in the deformation of the colliding nuclei [5]. However, most of the systems studied involved spherical nuclei where the couplings take place to surface vibrations. It is, therefore, of interest to look for possible transfer effects in the presence of a static deformation of the target and/or projectile.

Moreover, the fusion barrier distribution (BD) has been shown to permit deeper insight into fusion dynamics than the cross section itself. With the above motivation in mind, a quasi-elastic BD measurement has been carried out for the ^{28}Si+^{154}Sm system, whose target possesses a large static deformation. Precise quasi-elastic cross sections were measured for this system at large backward angles using the HYTAR (HYbrid Telescope ARray for quasi-elastic measurements) facility at IUAC, New Delhi and experimental BD was extracted using the method proposed by Timmers \emph{et al.} [6]. The predictions of coupled channels calculations, including the collective excitation of the target and projectile, are observed to reproduce the experimental BD rather well, indicating that the role of neutron transfer is in fact weak in this system. This observation is consistent with the earlier conclusion that the decrease in deformation parameter of residual nuclei after neutron transfer has no significant effect on fusion excitation function around Coulomb barrier energies [5]. The hexadecapole deformation of the ^{154}Sm nucleus has also been obtained from the BD analysis. Details of the experiment and coupled channel analysis will be presented during the conference.

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