Quasielastic barrier distributions for the ^{20}Ne+^{92,94,95}Mo systems: Influence of dissipation

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Barrier distributions are an excellent tool to reveal detailed structures in the energy dependence of the measured fusion cross-sections at energies close to the Coulomb barrier. The Coupled Channels (CC) model, successfully indicated the couplings of the relative motion to intrinsic degrees of freedom as main phenomena responsible for the strong enhancement of sub-barrier fusion cross sections as well as the observed structures in the barrier distributions for many systems. However, there are several mechanisms whose influence on the fusion is still not clear: for example the influence of weak (non-collective excitations) reaction channels on barrier height distributions and, consequently, on the fusion dynamics. The experimental barrier distributions of some systems turned out to be smooth (without any structure), in contradiction to theoretical predictions [1,2,3]. The effect of smoothing is caused by the influence of weak but numerous non-collective excitations of the systems. This experimental evidence led to the development of a new model able to include the non-collective excitations in the fusion reactions by extending the CC method using the random matrix theory (RMT) [4,5]. Very recently at the Heavy Ion Laboratory (HIL) of the University of Warsaw, the barrier distributions for ^{20}Ne+^{92,94,95}Mo systems were measured with the back-scattering method. The shapes of the barrier distributions for the three systems due to only collective excitations should be similar, determined mainly by the ^{20}Ne projectile structure. However, the influence of the larger number of single-particle excitations for heavier Mo isotopes should manifest in smoothing the barrier distribution. Preliminary results are shown in Figure 1, where the measured barrier distributions of ^{20}Ne+^{92,94,95}Mo are compared with the theoretical predictions within the CC and CC+RMT models. The barrier distribution in the ^{95}Mo loses the structure foreseen from the CC model, while it is preserved for the ^{92}Mo. Surprising is the case of the ^{94}Mo, whose structure is smoother and wider than the one predicted by both models.
Details of the obtained results and future plans on fusion and transfer cross-section measurements will be discussed in this contribution.

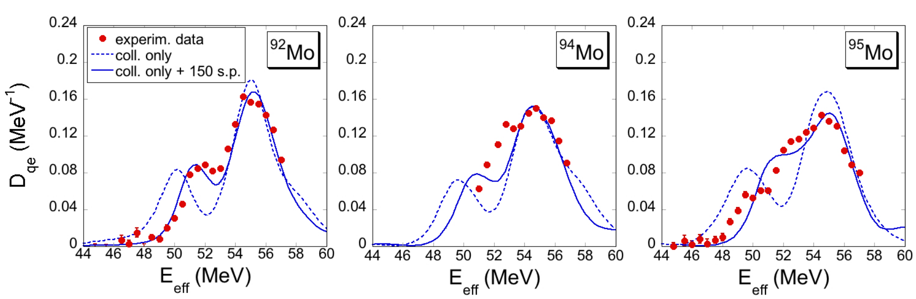

FIG. 1: Experimental data compared to predicted barrier distributions, with (solid lines) and without (dashed lines) including dissipation due to non-collective excitations.

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[3] A. Trzcińska et al., Phys. Rev. C **102** (2020) 034617
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