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Study of the $^{20}\text{Ne} + ^{130}\text{Te}$ system in a multi-channel approach within the NUMEN project

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The NUMEN project [1-2] aims to investigate specific heavy-ion double charge exchange (DCE) reactions in order to provide experimentally driven information about nuclear matrix elements (NMEs) of interest in the context of neutrinoless double beta decay ($0\nu\beta\beta$). To this extent, the $^{20}\text{Ne} + ^{130}\text{Te}$ system was experimentally investigated in a multi-channel approach by measuring the complete net of reaction channels, namely DCE [3], single charge exchange (SCE), elastic and inelastic scattering [4], one- and two-nucleon transfer reactions, characterized by the same initial state interaction. The goal of such a study is to fully characterize the properties of the nuclear wavefunctions entering in the $0\nu\beta\beta$ decay NMEs. The relevant experimental campaign was carried out at INFN-Laboratory Nazionali del Sud (LNS) in Catania using the Superconducting Cyclotron to accelerate the beams and the MAGNEX magnetic spectrometer [5] to detect the reaction ejectiles. The experimental challenges and the obtained results for the $^{20}\text{Ne} + ^{130}\text{Te}$ system will be presented and discussed.

- [1] F. Cappuzzello et al., Eur. Phys. J. A 54, 72 (2018).
- [2] F. Cappuzzello et al., Prog. Part. Nucl. Phys. 128, 103999 (2023).
- [3] V. Soukeras et al., Results in Physics 28, 104691 (2021).
- [4] D. Carbone et al., Universe 7, 58 (2021).
- [5] F. Cappuzzello et al., Eur. Phys. J. A 52, 167 (2016).

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