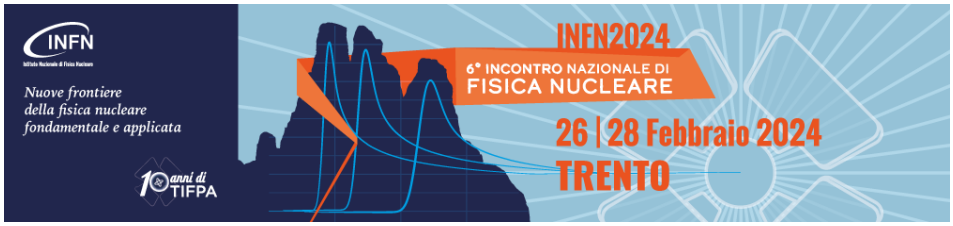

Contribution ID: **110** Type: **Oral**

Momentum dependent nucleon-nucleon contact interactions and their effect on p-d scattering observables

Wednesday, 28 February 2024 10:30 (20 minutes)

Starting from a complete set of relativistic nucleon-nucleon contact operators preserving parity and time reversal symmetries up to order $O(p^4)$ of the expansion in soft momenta p, we show that non-relativistic expansions of relativistic operators involve twenty-six independent combinations: two starting at $O(p^0)$, seven at order $O(p^2)$ and seventeen at order $O(p^4)$. This demonstrates the existence of two low-energy free constants that parameterize an interaction dependent on the total momentum of the pair of nucleons P. These, through the use of a unitary transformation, can be removed along with other redundant terms in the two-nucleon (2N) fourth-order contact interaction (N3LO) of the Chiral Effective Field Theory, generating a three-nucleon (3N) interaction at the same order. We express its short-range component in terms of five combinations of low-energy constants (LECs) that parameterize the N3LO 2N contact Lagrangian.
Within a hybrid approach in which this interaction is considered together with the phenomenological potential AV18, we show that the LECs involved can be used to fit very accurate data on the polarization observables of the low-energy p-d scattering, in particular the A_y asymmetry.

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Session Classification: Symmetries and Fundamental Interactions