**A phase-space representation of nucleon-nucleon potentials**

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Effective realistic nucleon-nucleon (NN) potentials that do not scatter to high momenta contain momentum dependent contributions. The Argonne potential [1] transformed by means of the Unitary Correlation Operator Method [2], for example, has a quadratic momentum dependence. Interactions arising from the Similarity Renormalization Group (SRG) method [3] show a more complicated momentum dependence. The Argonne potential [1] transformed by means of the Unitary Correlation Operator Method [2], and a potential with more complicated momentum dependencies, for example from a SRG transformation, would contribute terms also for higher \(\Lambda\).

![Phase-space representation](image)

Figure 1: Phase-space representation \(V_{\Lambda}^A(r,p)\) in arbitrary units for (a) \(V = V(r)\), (b) \(V = \frac{1}{2} (\vec{p}^2 V(r) + V(r) \vec{p}^2)\). (c) \(V = V(r) \vec{L}^2\). \(V(r) = e^{-\frac{r^2}{2\mu \sigma}}\).

These results show that the phase-space representation is able to visualize the (non-) local structure of a potential.

In further studies we plan to employ this method to investigate the momentum dependence of various realistic NN potentials given in matrix representation.

### References


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