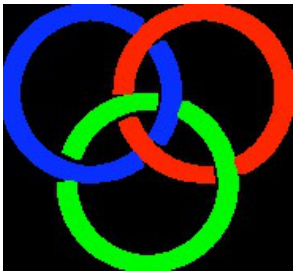

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Tunable Wigner states with dipolar atoms and molecules

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We study the few-body physics of trapped atoms or molecules with electric or magnetic dipole moments aligned by an external field. Using exact numerical diagonalization appropriate for the strongly correlated regime, as well as a classical analysis, we show how Wigner localization emerges with increasing coupling strength. The Wigner states exhibit non-trivial geometries due to the anisotropy of the interaction. This leads to transitions between different Wigner states as the tilt angle of the dipoles with the confining plane is changed. Intriguingly, while the individual Wigner states are well described by a classical analysis, the transitions between different Wigner states are strongly affected by quantum statistics. This can be understood by considering the interplay between quantum-mechanical and spatial symmetry properties. Finally, we demonstrate that our results are relevant to experimentally realistic systems.

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