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Self-adjoint extensions approach for singular Hamiltonians in Aharonov-Bohm systems

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Abstract: In Quantum Mechanics, it is very common to find singular Hamiltonians, especially in quantum systems with topological defects, which are usually modeled by point interactions. In general, it is possible to apply some kind of regularization procedure, as the vanishing of the wave function at the location of the singularity, ensuring that the wave function is square-integrable and then can be associated with a physical state. However, a study based on the self-adjoint extension approach can lead to more general boundary conditions that still give acceptable physical states. We exemplify the method by exploring the bound and scattering scenarios of a spin 1/2 charged particle with an anomalous magnetic moment in the Aharonov-Bohm potential in the conical space.

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