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Criteria for the Existence of Decoherence-free Subspaces

Decoherence-free subspaces (DFS) are spanned by such states of an open quantum system that are insensitive to the decoherence induced by the reservoir to which the system is coupled. DFS are immune to this coupling because of different physical effects, including destructive interference between different transition amplitudes or energy conservation.

We compare different definitions of DFS and explore rigorous criteria for the existence of DFS in finite-dimensional systems coupled to Markovian reservoirs. The advantages and disadvantages of various approaches are compared and a geometrical interpretation for DFS in qubit-systems is given.