Multi-particle decoherence free subspaces in extended systems

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— A decoherence-free subspace (DFS) is a collection of states that are immune to the noise derived from interactions with the environment. DFS is especially of interest for states involving two or more particles and is considered a prominent candidate for quantum memory and quantum information processing. We develop a method for finding DFS in real quantum systems. For systems with a homogeneous environment and energy-conserving coupling to the particles in 3D space, our methods show that perfect DFS exists for co-located particles only . This restriction does not exist for confined systems, such as atoms embedded in an optical fiber.

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