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Quantum speed limits for time evolution of a system subspace

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One of the fundamental physical limits on the speed of the time evolution of a quantum state is known in the form of the celebrated Mandelstam-Tamm inequality. This inequality gives an answer to the question on how fast can an isolated quantum system evolve from its initial state to an orthogonal one. Extensions of the Mandelstam-Tamm inequality give optimal speed bounds for the evolution between non-orthogonal initial and final states as well as for the evolution of mixed states. In the present work, we are concerned not with a single state but with a whole (possibly infinite-dimensional) subspace of the system states that are subject to the Schr\"odinger evolution. By using the concept of maximal angle between subspaces we derive an optimal bound on the speed of such a subspace evolution that may be viewed as a further generalization of the Mandelstam-Tamm inequality.

This is a joint work with Sergio Albeverio.

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