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Analytical results for the entanglement dynamics of disjoint blocks in the XY chain

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The study of the dynamics of entanglement measures after a quench has become a very active area of research in the last two decades, motivated by the development of experimental techniques. However, exact results in this context are available in only very few cases. In this talk, I present the results of a work done in collaboration with Gilles Parez, in which we provide the proof of the quasiparticle picture for the dynamics of entanglement entropies for two disjoint blocks in the XY chain after a quantum quench. As a byproduct, we also prove the quasiparticle conjecture for the mutual information in that model. Our calculations generalize those presented in [M. Fagotti, P. Calabrese, Phys. Rev. A 78, 010306 (2008)] to the case where the correlation matrix is a block-Toeplitz matrix, and rely on the multidimensional stationary phase approximation in the scaling limit. We also test the quasiparticle predictions against exact numerical calculations, and find excellent agreement. In the case of three blocks, we show that the tripartite information vanishes when at least two blocks are adjacent.

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