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Combining integrability and MPS methods to study the two-dimensional Heisenberg model ROBERT KONIK, Brookhaven National Laboratory, ANDREW JAMES, London Centre for Nanotechnology, J.-S. CAUX, Universiteit van Amsterdam — We employ a hybrid of matrix product state methods and exact solvability to study the two dimensional Heisenberg model in a cylindrical geometry. We analyze the two dimensional system by exploiting our ability to solve the one-dimensional subunits (i.e. spin chains) exactly using Bethe ansatz. This provides both the spectrum and the matrix elements of the one-dimensional chain. Having these in hand lessens the numerical burden when it comes to studying the fully two-dimensional system. We argue that at weaker values of the interchain coupling, the dynamics of the two dimensional system is dominated by the two- and four-spinon states of the chains. As the interchain coupling grows however, higher spinon states become more important. To reduce the number of basis states needed in such a case to represent the one-dimensional chains, we explore the use of adaptive bases.

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