Field-driven quantum phase transitions in a spin-1/2 Heisenberg antiferromagnet on an extended Lieb lattice

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In this study, we analyze the spin-1/2 Heisenberg model on the extended Lieb lattice with nearest-neighbor antiferromagnetic interactions in an external magnetic field. Using density matrix renormalization group simulations, we construct the ground-state phase diagram in the magnetic field vs. interaction ratio plane. The zero-temperature magnetization curves can exhibit several intermediate plateaus at 0, 1/5, and 3/5 of the saturation magnetization in addition to a gapless critical regime, where the magnetization changes continuously in response to the magnetic field. The character of magnetic-field-induced quantum phase transitions is further supported by the quantum Monte Carlo simulations at finite but low temperatures, where the peaks in the magnetic susceptibility become progressively smeared and reduced in height as the temperature increases. The numerical simulations were carried out using the open-source library Algorithms and Libraries for Physics Simulations [1].

References:

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This work was financially supported by The Ministry of Education, Research, Development and Youth of the Slovak Republic under the grant No. VEGA 1/0298/25, by the Slovak Research and Development Agency under Contract No. APVV-24-0091, and by the internal grant of Faculty of Science of Pavol Jozef Šafárik University in Košice under the contract No. VVGS-2025-3497.