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Ising tricriticality in the extended Hubbard model with bond dimerization[1] HOLGER FEHSKE, SATOSHI EJIMA, University Greifswald, Institute of Physics, FLORIAN LANGE, University Greifswald, Institute of Physics, Computational Condensed Matter Physics Laboratory, RIKEN, FABIAN H. L. ESSLER, Rudolf Peierls Centre for Theoretical Physics, Oxford University — We explore the quantum phase transition between Peierls and charge-density-wave insulating states in the one-dimensional, half-filled, extended Hubbard model with explicit bond dimerization. We show that the critical line of the continuous Ising transition terminates at a tricritical point, belonging to the universality class of the tricritical Ising model with central charge c=7/10. Above this point, the quantum phase transition becomes first order. Employing a numerical matrix-product-state based (infinite) density-matrix renormalization group method we determine the ground-state phase diagram, the spin and two-particle charge excitations gaps, and the entanglement properties of the model with high precision. Performing a bosonization analysis we can derive a field description of the transition region in terms of a triple sine-Gordon model. This allows us to derive field theory predictions for the power-law (exponential) decay of the density-density (spin-spin) and bond-order-wave correlation functions, which are found to be in excellent agreement with our numerical results.

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Holger Fehske
University Greifswald, Institute of Physics

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