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Hybrid-Space Density Matrix Renormalization Group Study of the Two-Dimensional Hubbard Model GEORG EHLERS, REINHARD M. NOACK, Philipps-University Marburg — We investigate the ground state of the two-dimensional Hubbard model on a cylinder geometry at intermediate coupling and weak doping. We study properties such as the behavior of the ground-state energy, pair-field correlations, and the appearance of stripes. We find striped ground states generically, with the width of the stripes depending on the filling, the boundary conditions, and the circumference of the cylinder. Furthermore, we analyse the interplay between the different stripe configurations and the decay of the pairing correlations. Our analysis is based on a hybrid-space density matrix renormalization group (DMRG) approach, which uses a momentum-space representation in the transverse and a real-space representation in the longitudinal direction. Exploiting the transverse momentum quantum number makes significant speedup and memory savings compared to the real-space DMRG possible. In particular, we obtain computational costs that are independent of the cylinder width for fixed size of the truncated Hilbert space.

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