

Abstract Submitted
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Universal thermodynamics of the superfluid to Mott insulator transition NICOLAS DUPUIS, Universite Paris 6, ADAM RANCON, University of Chicago — The superfluid–Mott-insulator transition of a Bose gas in an optical lattice, when it occurs at constant density, belongs to the universality class of the quantum XY model. We discuss the thermodynamics of the two-dimensional quantum $O(N)$ model for $N \geq 2$ in the vicinity of its zero-temperature quantum critical point, and in particular the universal scaling function \mathcal{F}_N which determines the pressure $P(T)$. We show that the large- N approach is unable to predict the (non-monotonous) shape of \mathcal{F}_N for $N < 10$, but \mathcal{F}_N can be computed from a renormalization-group approach. Finally, we discuss the experimental determination of the scaling function \mathcal{F}_2 from the pressure of a Bose gas in an optical lattice near the superfluid–Mott-insulator transition.

Adam Rancon
University of Chicago

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