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Bose condensation in topologically ordered quantum liquids TITUS NEUPERT, HUAN HE, CURT VON KEYSERLINGK, Princeton University, GERMAN SIERRA, UAM-CSIC Madrid, ANDREI BERNEVIG, Princeton University — The condensation of bosons can induce transitions between topological quantum field theories (TQFTs). This as been previously investigated through the formalism of Frobenius algebras and with the use of Vertex lifting coefficients. We discuss an alternative, algebraic approach to boson condensation in TQFTs that is physically motivated and computationally efficient. With a minimal set of assumptions, such as commutativity of the condensation with the fusion of anyons, we can prove a number of theorems linking boson condensation in TQFTs with algebra extensions in conformal field theories and with the problem of factorization of completely positive matrices over the positive integers. We propose an algorithm for obtaining a condensed theory fusion algebra and its modular matrices. For example, this formalism can be used to build multi-layer TQFTs which could be a starting point to build three-dimensional topologically ordered phases. Using this formalism, we also give examples of bosons that cannot undergo a condensation transition due to topological obstructions.

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