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The entanglement gap and a new principle of adiabatic continuity NICOLAS REGNAULT, Ecole Normale Superieure CNRS, RONNY THOMALE, Department of Physics, Princeton University, ANTOINE STERDYNIAK, Ecole Normale Superieure CNRS, BOGDAN ANDREI BERNEVIG, Department of Physics, Princeton University — We give a complete definition of the entanglement gap separating low-energy, topological levels, from high-energy, generic ones, in the "entanglement spectrum" of Fractional Quantum Hall (FQH) states. By removing the magnetic length inherent in the FQH problem - a procedure which we call taking the "conformal limit," we find that the entanglement spectrum of an incompressible ground-state of a generic (i.e. Coulomb) lowest Landau Level Hamiltonian re-arranges into a low-(entanglement) energy part separated by a full gap from the high energy entanglement levels. As previously observed, the counting of these levels starts off as the counting of modes of the edge theory of the FQH state, but quickly develops finite-size effects which we show can also serve as a fingerprint of the FQH state. As the sphere manifold where the FQH resides grows, the level spacing of the states at the same angular momentum goes to zero, suggestive of the presence of relativistic gapless edge-states. We use the entanglement spectrum in the conformal limit basis to investigate whether two states are topologically connected, by using the adiabatic continuity of the low entanglement energy levels.

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