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Gapless excitations in the Haldane-Rezayi state: The thin-torus limit[1] ALEXANDER SEIDEL, Department of Physics and Center for Materials Innovation, Washington University, St. Louis, MO 63130, USA, KUN YANG, National High Magnetic Field Laboratory, Florida State University, Tallahassee, Fl 32306, USA — We study the thin-torus limit of the Haldane-Rezayi state. Eight of the ten ground states are found to assume a simple product form in this limit, as is known to be the case for many other quantum Hall trial wave functions. The two remaining states have a somewhat unusual thin-torus limit, where a "broken" pair of defects forming a singlet is completely delocalized. We derive these limits from the wave functions on the cylinder, and deduce the dominant matrix elements of the thin-torus hollow-core Hamiltonian. We find that there are gapless excitations in the thin-torus limit. This is in agreement with the expectation that local Hamiltonians stabilizing wave functions associated with non-unitary conformal field theories are gapless. We also use the thin-torus analysis to obtain explicit counting formulas for the zero modes of the hollow-core Hamiltonian on the torus, as well as for the parent Hamiltonians of several other paired and related quantum Hall states. [Reference: A. Seidel, K. Yang, PRB 84, 085122 (2011)]

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Alexander Seidel
Department of Physics and Center for Materials Innovation,
Washington University, St. Louis, MO 63130, USA

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