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Bosonic integer quantum Hall effect as topological pumping MASAYA NAKAGAWA, Department of Physics, Kyoto University, SHUNSUKE FURUKAWA, Department of Physics, Univerisity of Tokyo — Topological pumping, originally proposed by Thouless, is a remarkable manifestation of topological nature of quantum states in transport phenomena. The Thouless pumping is induced by an adiabatic cycle of Hamiltonian of non-interacting fermions, and the total current during one cycle is given by the Chern number in parameter space which shares the same origin as the integer quantum Hall effect. Thus, a natural question is whether the connection between the topological pumping and the quantum Hall effect is also held in interacting systems. In this talk, we construct a novel interaction-induced topological pump corresponding to the bosonic integer quantum Hall (BIQH) state, which is a typical example of two-dimensional symmetry-protected topological phases of interacting bosons. The construction is based on a quasi-one-dimensional limit of quantum Hall states on a thin torus, and the resulting one-dimensional limit of the BIQH state is identified as the Haldane phase composed of two-component bosons which form effective spin-1 degrees of freedom. We also interpret the topological pumping by using the Berry phase of the topological Haldane phase under twisted boundary conditions.

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