Quantized Nonlinear Thouless Pumping and Photonic Landau Levels

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Abstract

I will present my group's recent work on the fractional pumping of solitons in photonic Thouless pumps. Specifically, I will show that the displacement (in unit cells) of solitons in Thouless pumps is strictly quantized to the Chern number of the band from which the soliton bifurcates in the low power regime; whereas in the intermediate power regime, nonlinear bifurcations lead to fractional quantization of soliton motion. This fractional quantization can be predicted from multi-band Wannier functions associated with the states of the pump. Time permitting, I will also present our work on the realization of Landau levels in photonic crystal slabs, including the use of both pseudomagnetic and pseudoelectric fields to flatten them.