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Two-dimensional Fibonacci spiral optical thermal ratchets KE XIAO, DAVID GRIER, Center for Soft Matter Research at New York University — A novel two-dimensional optical thermal ratchet has been implemented with holographic optical trapping arrays structured as the "Fibonacci spiral" for diffusing colloidal particles. Periodically rotating the optical trapping array by an angle in a three-step cycle yields a two-dimensional time-varying optical landscape that acts either as (1) a deterministic pump when traps are closely dispersed in space, whose induced radial and azimuthal fluxes can be quantitatively mapped out according to the geometry of Fibonacci spiral, or else as (2) an optical thermal ratchet when traps are widely dispersed, whose transport property depends on the competition between the temporal evolution in optical landscapes and Brownian particles' diffusivity. The Fibonacci ratchet displays independent flux reversals in both the radial and azimuthal directions as a function of the cycle frequency and the inter-trap separation.

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