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Bulk detection of time-dependent topological transitions in quenched chiral models

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The topology of one-dimensional chiral systems is captured by the winding number of the Hamiltonian eigenstates. We proved that this invariant can be read-out by measuring the Mean Chiral Displacement of a single-particle wavefunction that is connected to a fully localized one via a unitary and translation-invariant map. Remarkably, this implies that the Mean Chiral Displacement can detect the winding number even when the underlying Hamiltonian is quenched between different topological phases. We confirm experimentally these results in a photonic quantum walk, realized in the transverse-momentum space of structured light.

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