Sublattice scars in a two-dimensional U(1) quantum link model

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We discuss the structure and properties of a class of anomalous high-energy states of matter-free U(1) quantum link gauge theory Hamiltonians using numerical and analytical methods. Such anomalous states, known as quantum many-body scars in the literature, have generated a lot of interest due to their athermal nature. We demonstrate the formation of such scars from the superposition of exact zero modes in a particular U(1) gauge theory. In particular, a class of such anomalous eigenstates, which we dub as *sublattice scars*, seem to be perfectly structured if a particular local observable is probed, even though these states are high-energy eigenstates. A "triangle relation" that connects some anomalous zero modes with other states with nonzero integer eigenvalues will be discussed.