Perfect Matchings, Channels, and 2-Divisibility

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A *perfect matching* of a graph is a subset of edges in the graph such that each vertex is contained in exactly one edge. We study the number of perfect matchings of a given graph. In particular, we are interested in the power of two that divides this number. A new type of vertex set called a channel is considered, the presence of which is associated to powers of two in the perfect matching count. This gives a method for determining lower bounds on such powers. Algebraic and involutive proofs are given for these results, and methods for channel identification are given. We specialize to perfect matchings on subgraphs of the square lattice, which are identified with domino tilings of the plane, and apply channels towards solving some conjectures by Pachter.