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Static Holes in Geometrically Frustrated Bow Tie Ladder

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WOLFRAM BRENIG, Physics Department, Technische Universität Carolo Wilhelmina zu Braunschweig — Doping of the geometrically frustrated bow-tie spin ladder¹ with static holes is investigated by a complementary approach using exact diagonalization and hard-core quantum dimers. Results for the thermodynamics in the undoped case, the singlet density of states, the hole-binding energy, and the spin correlations will be presented. We find that the static holes polarize their vicinity by a localization of singlets in order to reduce the frustration. As a consequence the singlet polarization cloud induces short range repulsive forces between the holes with oscillatory longer range behavior. For those systems we have studied, most results for the quantum dimer approach are found to be qualitatively if not quantitatively in agreement with exact diagonalization. The ground state of the undoped system is non-degenerate with translationally invariant nearest-neighbor spin correlations up to a few unit cells, which is consistent with a spin liquid state or a valence bond crystal with very large unit cell.

¹C. Waldtmann, A. Kreuzmann, U. Schollwöck, K. Maisinger, and H.-U. Everts, Phys. Rev. B **62**, 9472 (2000).

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