# The Magnetization processes of the exact dimer ground state of the maple leaf model: interactions, correlated hopping, and bound states

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We present the exact dimer ground state of a quantum antiferromagnet on the maple-leaf lattice [1]. A coupling anisotropy for one of the three inequivalent nearest-neighbor bonds is sufficient to stabilize the dimer state. Together with the Shastry-Sutherland Hamiltonian [2], this is the only other model with an exact dimer ground state for all two-dimensional lattices with uniform tilings. By performing Numerical simulations, we show that the exact dimer state in the current model is more stable than the same in the Shastry-Sutherland model.

To further understand the magnetic characteristics of this model, we investigate its behavior in the presence of an external uniform magnetic field. By treating the magnetic excitations produced by the field as Bose particles and applying strong-coupling expansion we develop an effective Hamiltonian for the magnetic particle interactions. This effective theory allows us to predict several novel magnetization plateaus. We will also discuss how the lattice's structure influences the dynamical behavior of these magnetic excitations, causing multi-particle bound states to condense and give rise to very low magnetizations.

[1] P. Ghosh, T. Müller, R. Thomale, Phys. Rev. B **105**, L180412 (2022).

[2] B. S. Shastry and B. Sutherland, Physica B+C **108**, 1069 (1981)