

Emergent Haldane phase in the $S = 1$ bilinear-biquadratic Heisenberg model on the square lattice: *supplemental material*

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(Dated: May 2, 2017)

I. DETAILED DATA OF THE IPEPS SIMULATIONS OF THE ANISOTROPIC MODEL

In Fig. 1 we provide the iPEPS energies (for $D = 10$, simple update) for different cuts in the phase diagram of the anisotropic model which were used to get an estimate of the phase boundary between the Haldane and AF phase, or Haldane and 3-sublattice phase, respectively (see main text). The phase transitions occur where the energies of the states intersect. This data was used to plot the phase diagram of the anisotropic model shown in Fig. 3 in the main text.

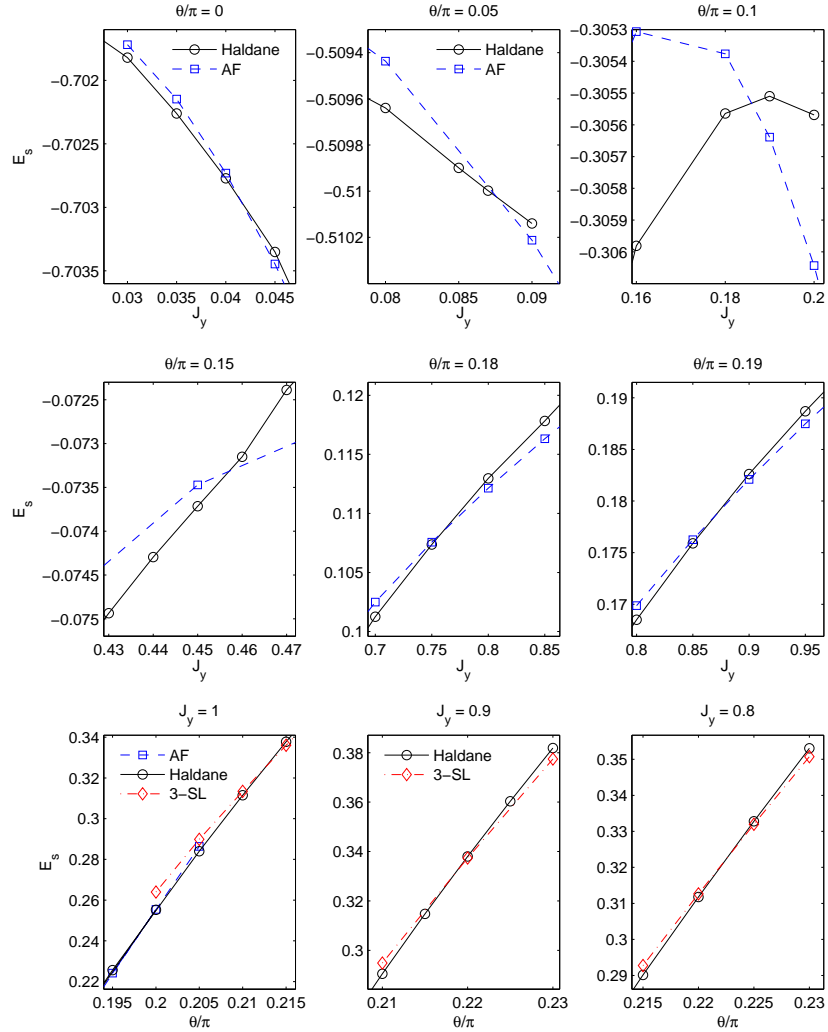


FIG. 1: iPEPS energies for $D = 10$ (simple update) as a function of J_y (or θ/π) for fixed values of θ/π (or J_y).