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SU(2)-invariant spin 1/2 Hamiltonians with RVB and other valence bond phases KUMAR S. RAMAN, SHIVAJI L. SONDHI, Princeton University, RODERICH MOESSNER, Ecole Normale Superieure — We construct a family of rotationally invariant, local, S=1/2 Hamiltonians of the Klein-AKLT variety that exhibit ground state manifolds spanned by nearest neighbor valence bond states. To these, we add perturbations which drive the systems into phases modelled by well understood quantum dimer models on the corresponding lattices. We compute within the valence bond manifold by treating the overlap between states as a small expansion parameter. We introduce a bond decoration scheme which makes this overlap expansion asymptotically exact. This leads to i) a Z_2 RVB phase on a decorated two dimensional pentagonal lattice and ii) a Cantor deconfined region on a decorated two dimensional honeycomb lattice. In case (i), we give strong evidence that the spinon and vison excitations are gapped. This work is the first demonstration of RVB liquid physics in an SU(2)-invariant spin system in the thermodynamic limit.

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