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Exact solution of a generalized ANNNI model on a Cayley tree.

Summary: We consider the Ising model on a rooted Cayley tree of order two with nearest neighbor inter-
actions and competing next nearest neighbor interactions restricted to spins belonging to the same branch
of the tree. This model was studied by Vannimenus who found a new modulated phase, in addition to the
paramagnetic, ferromagnetic, antiferromagnetic phases and a (+ + - -) periodic phase. Vannimenus’s results
are based on an analysis of the recurrence equations (relating the partition function of an $n$-generation tree
to the partition function of its subsystems containing $(n - 1)$ generations) and most results are obtained
numerically. In this paper we analytically study the recurrence equations and obtain some exact results:
critical temperatures and curves, number of phases, partition function.

Keywords: Cayley tree; configuration; Ising model; phase; Gibbs measure
doi:10.1007/s11040-014-9144-7