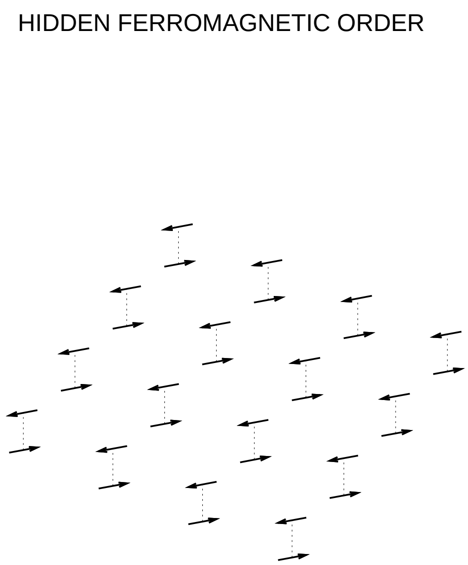

FIG. 1: Shown are two groundstates of a square lattice of spin-1 iron atoms that violate Hund's rule, but that exhibit hidden magnetic order. [See Eq. (1) and Table I.]

	True cSDW	True Néel	True Ferromagnet
Hidden Ferromagnet	$-J_{0c} = 2(J_1^{\perp} - J_1^{\parallel}) - 4J_2^{\parallel}$	$-J_{0c} = 4J_2^{\perp} - 4J_1^{\parallel}$	$-J_{0c} = 4J_2^{\perp} + 4J_1^{\perp}$
Hidden Néel	$-J_{0c} = 2(J_1^{\parallel} - J_1^{\perp}) - 4J_2^{\parallel}$	$-J_{0c} = 4J_2^{\perp} - 4J_1^{\perp}$	$-J_{0c} = 4J_2^{\perp} + 4J_1^{\parallel}$

TABLE I: Listed are the phase boundaries that separate true magnetic order from hidden magnetic order. The critical Hund's rule coupling is obtained by balancing the classical energies of the model Hamiltonian (1).

Here we have applied a magnetic field to the system, $\mathbf{h}_i(\alpha)$, that is in principle sensitive to the orbital degree of freedom, $\alpha = a$ or b. If the external magnetic field is a plane-wave with wavenumbers $\mathbf{k}$ and frequency ω, then its transverse component with respect to the spin axis for hidden magnetic order generates a corresponding linear response in the transverse