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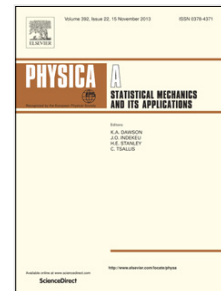
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# Phases Diagrams and Magnetic Properties of Tri-layer Superlattices: Mean Field Study

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## Abstract

Motivated by spintronic device applications, we engineer a superlattice model based on periodic tri-layers consisting of spins  $\sigma = \frac{1}{2}$ ,  $S = 1$  and  $q = \frac{3}{2}$  residing on the sites of a square lattice, interacting with an external magnetic field. We study its phase diagrams and magnetic properties. We determine the corresponding ground state phase diagrams. Then, we show that this Ising lattice model exhibits a ferromagnetic phase  $F_1$ , two ferrimagnetic phases  $F_2, F_3$  and an antiferromagnetic phase  $F_4$ . It is found that the magnetic behaviors depend on the moduli space controlled by the exchange interaction couplings. More precisely, the hysteresis loops have been established.

**KeyWords:** Super-lattice, Ising model, Magnetic properties, Mean field approximation.

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