Classical spin dynamics of four interacting magnetic particles on a ring

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In the present work, we study the deterministic spin dynamics of four interacting magnetic particles, with both dipolar and exchange interactions in the presence of an applied magnetic field, by means of the Landau-Lifshitz equation without the dissipation term. In particular, we analyze the ring geometrical configuration with periodic boundary conditions for the exchange coupling. In addition, we explore the parameter space by numerically calculating some bifurcation diagrams. Due to the strength ratio of interactions, two time scales appear. Finally, we find that the total magnetization is not conserved and it has a strong dependence on the control parameters.