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**Phase transitions of a quantum chain with four-spin interactions in longitudinal and transverse magnetic fields** B. BOECHAT, J. FLORENCIO, A. SAGUIA, Universidade Federal Fluminense, O. F. DE ALCANTARA BONFIM, University of Portland — We study the ground-state properties of a spin-1/2 model on a chain containing four-spin Ising-like interactions in the presence of both transverse and longitudinal magnetic fields. We use entanglement entropy and finite-size scaling methods to obtain the phase diagrams of the model. Our numerical calculations reveal a rich variety of phases and the existence of multi-critical points in the system. We identify phases with both ferromagnetic and anti-ferromagnetic orderings. We also find periodically modulated orderings formed by a cluster of like-spins followed by another cluster of opposite like-spins. The quantum phases in the model are found to be separated by either first or second order transition lines.

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