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Spin-orbital physics for t_{2g} electron in FCC lattice with application to ordered double perovskites GANG CHEN, University of California Santa Barbara, RODRIGO PEREIRA, LEON BALENTS, Kavli Institute for Theoretical Physics — Ordered double perovskites $A_2BB'O_6$ are derived compounds from the usual perovskites ABO_3 by selectively replacing half of the B ions with magnetic ions B′ so that the B′ ions form an FCC lattice structure with a lattice constant twice the original cubic lattice of the B ions. Motivated by recent experiments on ordered double perovskites, we started from a microscopic nearest neighbor exchange Hamiltonian and relativistic spin-orbit interaction, and analyzed the spin-orbital physics for different regimes of coupling parameters. We found that when the spin-orbit coupling is weak compared to the exchange, the system develops real orbital order and weakly-coupled layered spin order primarily driven by the exchange. When the spin-orbit coupling is strong, we suggested three different candidate ground states. They are ferromagnetic state, complex orbital order with ordering wavevector $\mathbf{p} = 2\pi(001)$ and the spin-orbital liquid state. Realization of these states in different double perovskites are discussed.

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