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Topological magnon bands and unconventional superconductivity in pyrochlore iridate thin films PONTUS LAURELL, GREGORY A. FIETE, Univ of Texas, Austin — We theoretically study the magnetic properties of pyrochlore iridate bilayer and trilayer thin films grown along the [111] direction using a strong coupling approach. We find the ground state magnetic configurations on a mean field level and carry out a spin-wave analysis about them. In the trilayer case the ground state is found to be the all-in/all-out (AIAO) state, whereas the bilayer has a deformed AIAO state. For all parameters of the spin-orbit coupled Hamiltonian we study, the lowest magnon band in the trilayer case has a non-zero Chern number. In the bilayer case we also find a parameter range with non-zero Chern numbers. We calculate the magnon Hall response for both geometries, finding a striking sign change as function of temperature. Using a slave-boson mean-field theory we study the doping of the trilayer system and discover an unconventional time-reversal symmetry broken $d + id$ superconducting state. Our study complements prior work in the weak coupling limit and suggests that the [111] grown thin film pyrochlore iridates are a promising candidate for topological properties and unconventional orders.

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