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Theory of the magnetic properties of the bilayer iridate $Sr_3Ir_2O_7$ VERA I. SCHNELLS, Institute for Theoretical Physics and Astrophysics, University of Würzburg, Am Hubland D-97074 Würzburg, Germany, HENRIK M. RøNNOW, Laboratory for Quantum Magnetism, École Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland, FRÉDÉRIC MILA, Institute of Theoretical Physics, École Polytechnique Fédéale de Lausanne, CH-1015 Lausanne, Switzerland — We propose a bilayer pseudospin-1/2 anisotropic Heisenberg model to describe the magnetic properties of the iridate $Sr_3Ir_2O_7$ at zero temperature using a combination of analytical and numerical methods to explore the excitation spectrum of the system. From x-ray scattering (RIXS) experiments, it is known that the compound's lowest magnetic excitation has a large spin gap of ~ 92 meV and a bandwidth of ~ 70 meV. Treating our model using bond-operator mean-field theory, it was possible to reproduce these features accurately. The anisotropy selects an easy c-axis collinear antiferromagnetic ground state that has also been observed experimentally. In comparison to other proposed models, we were able to describe both the first and second magnetic excitation branches as transverse and longitudinal triplet excitations.

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