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Rapidly fluctuating orbital occupancy above the orbital ordering transition in spin-gap compounds[1] FRANCISCO RIVADULLA, BEATRIZ RIVAS-MURIAS, Physical Chemistry Dept. and Center for Research in Biological Chemistry and Molecular Materials, Univ. Santiago Compostela, Spain, HAIDONG ZHOU, National High Magnetic Field Laboratory, Florida State University, Tallahassee, FL 32306-4005, USA, JOSE RIVAS, Applied Physics Department, University of Santiago de Compostela, Spain — Low-dimensionality spin systems develop a spin-dimer phase within a molecular orbital that competes with long-range antiferromagnetism below TS. Very often, preferential orbital occupancy and ordering are the actual driving force for dimerization, as in the orbitally-driven spin-Peierls (MgTi2O4, CuIr2S4, La4Ru2O10, NaTiSi2O6, etc.). Through a microscopic analysis of the thermal conductivity in La4Ru2O10, we show that the orbital occupancy fluctuates rapidly above TS, resulting in an orbital-liquid state. Strong orbital-lattice coupling introduces dynamic bond-length fluctuations that scatter the phonons to produce a glass-like thermal conductivity above TS. This phonon-glass to phonon-crystal transition occurs in other spin-dimer systems, like NaTiSi2O6, pointing to a general phenomenon.

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