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Magnetic Excitation Spectrum of Doped and Undoped Spin Ladders B. LAKE, S. NOTBOHM, D. A. TENNANT, Hahn-Meitner Institut, R. I. BEWLEY, C. D. FROST, P. MANUEL, ISIS Facility, R. S. ECCLESTON, Sheffield Hallam University, K. P. SCHMIDT, Ecole Polytechnique Federale de Lausanne, G. S. UHRIG, gu@thp.uni-koeln.de, P. RIBEIRO, C. HESS, C. SEKAR, R. KLINGELER, G. KRABBES, G. BEHR, B. BUCHNER, IFW Dresden — We present inelastic neutron scattering measurements of three spin-ladder compounds. All are based on two-dimensional copper oxide layers where the copper ions form two-leg, spin-1/2, spin-ladders. Strong antiferromagnetic interactions couple the spin moments along the legs and rungs of the ladder, weaker higher order four-spin ring exchange terms exist, while interladder coupling is weak and frustrated. Two-leg spin-1/2 spin-ladders are characterized by gapped, well-defined one-magnon excitations and multi-magnon continuum excitations. $CaCu_2O_3$ has a weak rung interaction (compared to the leg) and a strong ring interaction which act to drive the system gapless and quantum critical. $La_4Sr_{10}Cu_{24}O_{41}$ has a stronger rung and is gapped. Both compounds are undoped and their magnetic excitation spectrum is compared to theoretical models. The third material, $Sr_{2.5}Ca_{11.5}Cu_{24}O_{41}$, is similar to $La_4Sr_{10}Cu_{24}O_{41}$ but with holes on the ladder. The holes give rise to significant changes in the excitations which are discussed and compared to theory and the excitation spectrum of high-T_c superconductors.

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