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Static and dynamic properties of a strong-leg spin ladder DAVID SCHMIDIGER, SEBASTIAN MUEHLBAUER, SEVERIAN GVASALIYA, ANDREY ZHELUDEV, Neutron Scattering and Magnetism Group, ETH Zurich, Laboratory for Solid State Physics, PIERRE BOUILLOT, DPMC-MaNEP, University of Geneva, CORINNA KOLLATH, Departement de Physique Theorique, University of Geneva, THIERRY GIAMARCHI, DPMC-MaNEP, University of Geneva — Static and dynamic properties of the strong-leg S = 1/2 Heisenberg spin ladder system $(C_7H_{10}N)_2CuBr_4$ are studied using inelastic neutron scattering and neutron diffraction experiments, as well as bulk magneto-thermodynamic measurements. The leg-odd excitation channel is dominated by long-lived single-magnon states in the entire Brillouin zone, which supports a symmetric-ladder model for this material [1]. In the leg-even channel, a considerable fraction of the spectral weight is contained in a novel long-lived two-magnon bound state. Contrary to reports by other authors, in applied magnetic fields we observe a Bose-Einstein condensation of magnons that manifests itself if 3D long-range antiferromagnetic ordering. The latter emerges beyond H_c=2.8 T and is due to weak inter-chain interactions. The field-temperature phase diagram showing the spin liquid, Tomonaga-Luttinger spin liquid and BEC phases is mapped out. The experimental results are in spectacular agreement with DMRG calculations. The latter provide additional insight on certain spin ladder properties specific to the strong-leg regime.

[1] D. Schmidiger, S. Mühlbauer, S. N. Gvasaliya, T. Yankova, and A. Zheludev Phys. Rev. B 84, 144421 (2011).

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