Nonmagnetic impurities in a frustrated spin ladder\textsuperscript{1} ERIK WULF, SEBASTIAN MÜHLBAUER, TATIANA YANKOVA, VASILY GLAZKOV, ANDREY ZHELUDEV, ETH Zürich, Schafmattstr. 16, 8093 Zürich, Switzerland — 
Sul-Cu\textsubscript{2}Cl\textsubscript{4} is a representative of the spin S=1/2 4-leg ladders. Due to weak inter-ladder interactions it shows almost perfect 1D character. The singlet ground state is separated from the excited triplet state by a gap of $\Delta=0.52\text{meV}$ which can be closed by a critical field of $H_c=3.7T$. At $H_c$ the disordered spin liquid undergoes a phase transition to chiral helimagnetic order. By replacing nonmagnetic chlorine atoms by nonmagnetic bromine atoms random bond disorder is introduced in Sul-Cu\textsubscript{2}(Cl\textsubscript{1-x}Br\textsubscript{x})\textsubscript{4}. Measurements of the magnetization and the specific heat show a drastically changed behavior in an applied field even at low bromine concentrations. At $T>0$ the material exhibits an intermediate phase between the spin liquid phase and the helimagnetic ordered phase for $x=0.01$, while the phase transition to the helimagnetic order is suppressed already for $x=0.025$. Nevertheless, the critical field $H_c$ to overcome the excitation gap is independent from the impurity concentration.

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