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Complex field-induced states in Linarite $\text{PbCuSO}_4(\text{OH})_2$ with a variety of high-order exotic SDW_p states¹

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Low-temperature neutron diffraction and NMR studies of field-induced phases in linarite are presented for magnetic fields $H \parallel b$ axis. This way, we establish the magnetic phase diagram up to saturation. A two-step spin-flop transition is observed as well as a transition transforming a helical magnetic ground state into an unusual magnetic phase with sine-wave modulated moments $\parallel H$ enclosing all other magnetic phases in the $T - H$ phase diagram. An effective $\tilde{J}_1 - \tilde{J}_2$ single-chain model with a magnetization-dependent frustration ratio $\alpha_{eff} = -\tilde{J}_1/\tilde{J}_2$ is proposed. The latter is governed by skew interchain couplings and shifted to the vicinity of the ferromagnetic critical point. It explains qualitatively the observation of a rich variety of exotic (for strongly correlated cuprate spin-1/2 Heisenberg systems) longitudinal collinear spin-density wave SDW_p states ($9 \geq p \geq 2$).

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