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Phase diagram of the 2D frustrated quantum magnet Cs_2CuCl_4 in applied field

RADU COLDEA, University of Bristol, UK

We use neutron scattering, magnetization and specific heat to probe how the ground state of the 2D spin-1/2 anisotropic triangular lattice antiferromagnet Cs_2CuCl_4 evolves as a function of applied magnetic field. We observe that the zero- field incommensurate spin spiral is suppressed by relatively small in-plane fields giving way to a commensurate 2D antiferromagnetic pattern stable over most of the intermediate field region, with incommensurate order appearing again for a narrow field range just below ferromagnetic saturation. The commensurate phase is not captured by a classical mean-field approach, suggesting that quantum fluctuations may be important in stabilizing this type of order.