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Phases of spatially anisotropic triangular antiferromagnet in high magnetic field OLEG STARYKH, University of Utah, ANDREY CHUBUKOV, University of Wisconsin — We investigate phases of the Heisenberg spin model on a spatially anisotropic triangular lattice as a function of $J'/J < 1$ and a magnetic field H (J is the exchange along the horizontal bonds, and J' is the exchange along the diagonal bonds). The anisotropy of J's competes with quantum fluctuations and this competition leads to a rich phase diagram. Immediately below the saturation field H_s we find three phases: three-sublattice commensurate phase, incommensurate coplanar "fan" phase, and incommensurate non-coplanar "cone" phase. The former two are supersolids while the latter is a superfluid in the terminology of strongly interacting bosons. At a finite boson density ($H < H_s$) and on approach to the fan-cone phase boundary from within the cone phase with ordering momentum Q, we observe softening of the "roton" minima at momentum Q' different from $-Q$, which one would expect for a direct cone-fan transition. This points on the existence of the intermediate double-spiral state in which boson density exhibits incommensurate modulations with momenta Q and Q'. The extrapolation of our results to $H \sim H_s/3$ predicts that $Q' = Q$, and the intermediate state becomes similar to the "distorted umbrella" state that emerges out of up-up-down phase. We discuss the implications of our findings for the global phase diagram of the anisotropic triangular Heisenberg antiferromagnet.

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