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**Magnon pairing in Quantum Spin Nematic**

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The phenomenon of the Bose-Einstein condensation is inherent not only to superfluid He-4 and cold atomic gases but also describes in a unified way a variety of field-induced transitions in quantum magnets. In this talk we discuss a novel example of the Bose-Einstein condensation of bound magnon pairs. The binding mechanism is based on a competition between ferro- and antiferromagnetic exchange bonds in a frustrated quantum spin system. As a result bound magnon pairs are formed in the fully polarized magnetic state at high fields. Upon decreasing field magnon pairs undergo a condensation into a state which is bosonic analog of a BCS superconductor [1]. The magnon-pair condensate lacks a conventional transverse magnetic order and is described instead by a quadrupolar or spin-nematic order parameter. We consider in detail magnon-pairing mechanism for two spin models: frustrated chains weakly coupled by interchain interactions and frustrated square-lattice antiferromagnet, which exhibit high-field spin-nematic states. Our theory predicts existence of the long-range spin-nematic phase in the frustrated chain material LiCuVO4. We also review recent experimental evidences, which support presence of a new phase in this material. Work done in collaboration with H. Tsunetsugu (ISSP, University of Tokyo)

[1] M. E. Zhitomirsky and H. Tsunetsugu, Europhys. Lett. 92, 37001 (2010).