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Consistent theory of magnetism and superconductivity in iron pnictides MICHAIL KATSNELSON, Radboud University Nijmegen, Netherlands , VLADIMIR ANTROPOV, LIQIN KE, Ames Laboratory, USA, MARK VAN SCHILFGAARDE, Kings College, London, UK — We show that iron pnictide systems possess unusual quantum spin fluctuations which strongly affect their magnetic properties and may be relevant in the mechanism of superconductivity. These fluctuations represent highly non-linear aharmonic excitations and have both transversal and longitudinal components which may contribute differently to the observed properties. From the point of view of magnetism, these fluctuations are responsible for the stability of the observed magnetic ground states, and thus determine the spin-wave spectra. The anharmonic character of the excitations under consideration provides a strong coupling with electron degrees of freedom which may be relevant for the appearance of high-temperature superconductivity. We discuss a mechanism of superconductivity related to spin fluctuation which uses the same pool of fluctuations to explain the Cooper pairing. Theory predicts some correlations between superconductivity temperature and magnetic characteristics and they seem to be in agreement with the available experimental data for pnictides and selenides. We discuss also other materials where one can expect a similar behavior.

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