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Spin fluctuations in alkali-metal iron selenide superconductors probed by inelastic neutron scattering

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We employ inelastic neutron scattering (INS) on iron-based superconductors to study the spectrum of low-energy magnetic excitations. According to the most commonly accepted theory of the superconducting state, spin fluctuations could act as the bosonic "glue" that mediates Cooper pairing in Fe-based compounds, thus playing the role similar to that of phonons in the conventional BCS theory. The knowledge of the spin-fluctuation spectrum is therefore important for understanding the mechanisms that stabilize high transition temperatures in Fe-based superconductors. Our most recent results include observations of magnetic resonant modes and normal-state paramagnon excitations in alkali-metal iron selenide superconductors $Rb_xFe_2Se_2$ and $K_xFe_2Se_2$. These excitations were found at a wave vector that differs from the ones characterizing magnetic resonant modes in other iron-based superconductors, but appears to be universal for all alkali-metal iron selenide compounds independently of the alkali-metal element or the crystal-growth procedure. Using time-of-flight neutron spectroscopy, we also estimated the absolute spectral weight of the magnetic resonant mode, which exceeds that in the iron arsenides.