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Itinerant spin excitations and superconductivity in $BaFe_{2-x}Ni_xAs_2$[1] HUIQIAN LUO, DONGLIANG GONG, TAO XIE, ZHAOYU LIU, SHILIANG LI, Institute of Physics (CAS), KAZUYA KAMAZAWA, KAZUKI IIDA, RYOICHI KAJIMOTO, Research Center for Neutron Science and Technology (CROSS) Japan, ALEXANDRE IVANOV, JIRI KULDA, MECHTHID ENDERLE, Institut Laue-Langevin France, DEVASHIBHAI ADROJA, ISIS Facility (RAL) UK, PENGCHENG DAI, Rice University, USA — High-temperature superconductivity in iron pnictides emerges from electron or hole doped parent compounds with antiferromagnetic order, which is argued to be associated with both the presence of high-energy spin excitations and a coupling between low-energy spin excitations and itinerant electrons. Recently, we have used time-of-flight neutron spectroscopy to carefully map out the spin excitations in the electron overdoped $BaFe_{2-x}Ni_xAs_2$ especially around the zone boundary of superconductivity. We have found a spin gap actually emerges after the vanishing of zero resistivity and directly responses to the disappearance of superconductivity. Further polarized neutron analysis indicate that the spin gap actually is anisotropic, and the longitudinal mode of spin fluctuations, as a hallmark of the itinerant magnetism from Fermi surface nesting, is totally eliminated together with the hole pockets near the electron-overdoped zone boundary of superconductivity. Our results suggest that the itinerant spin excitations originated from Fermi surface nesting are crucial to the superconductivity in iron pnictides.

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