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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 [1]. With more than 6 years' efforts, we have used time-of-flight neutron spectroscopy to extensively map out the spin excitations in the electron-doped BaFe_{2-x}Ni_xAs₂ especially around the overdoped zone boundary of superconductivity. We have found that the high energy spin fluctuations survive in the extremely high doping $x=0.6$ far beyond the superconducting dome [2], but the low energy spin excitations including the spin resonance mode is very sensitive to the electron dopings [3], by finally forming a large spin gap just after the disappearance of superconductivity in the overdoped regime [4]. 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 [5], is totally eliminated together with the hole pockets near the electron-overdoped zone boundary of superconductivity [6]. Our results suggest that the strong fluctuations from local moments give framework for magnetic interaction, while itinerant spin excitations originated from Fermi surface nesting are crucial to the superconductivity in iron pnictides.

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