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Magnetic resonant excitations in S-doped iron-chalcogenide superconductors

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A sharp magnetic collective mode appearing inside the superconducting energy gap in the spin excitation spectrum is a smoking-gun evidence for phase-reversed electron-pairing symmetry in unconventional superconductors. Such mode has been observed by inelastic neutron scattering in many of iron-based superconductors, in which the phase-reversed $s_{\pm}$-wave pairing symmetry had been proposed. Yet, it is still under an active debate about the exact pairing symmetry of recently discovered 122-type iron-chalcogenide despite the presence of the spin resonant mode mostly due to the absence of hole Fermi surface at the Brillouin zone center. Here, we present a systematic study of inelastic neutron scattering on the sulfur-doped iron-chalcogenide KxFe2-y(Se1-zSz)2 [z=0,0.25,0.4,0.5] to clarify how S-doping affects to the spin fluctuations and the magnetic resonant excitations. Further, we discuss the physical implication of our inelastic neutron scattering data based on the tight relationship between the magnetic resonant mode and superconducting order parameter symmetry.

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