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Doping dependence of spin excitations and its correlations with high-temperature superconductivity in iron pnictides MENG WANG, XINGYE LU, HUIQIAN LUO, XIAOTIAN ZHANG, Institute of Physics, Chinese Academy of Sciences, CHENGLIN ZHANG, YU SONG, PENGCHENG DAI, Department of Physics and Astronomy, Rice University, MIAOYIN WANG, GUOTAI TAN, Department of Physics and Astronomy, The University of Tennessee, E.A. GOREMYCHKIN, T.G. PERRING, ISIS Facility, Rutherford Appleton Laboratory, T.A. MAIER, Oak Ridge National Laboratory, ZHIPING YIN, KRISTJAN HAULE, GABRIEL KOTLIAR, Department of Physics, Rutgers University — Since spin excitations may be responsible for electron pairing and superconductivity in iron pnictides, it is important to determine their electron/hole-doping evolution and connection with superconductivity. Here we use inelastic neutron scattering to show that while electron doping to the antiferromagnetic $BaFe_2As_2$ parent compound modifies the low-energy spin excitations and their correlation with superconductivity (< 50 meV) without affecting the high-energy spin excitations (> 100 meV), hole-doping suppresses the high-energy spin excitations and shifts the magnetic spectral weight to low-energies. In addition, our absolute spin susceptibility measurements for the optimally hole-doped iron pnictide reveal that the change in magnetic exchange energy below and above Tc can account for the superconducting condensation energy. These results suggest that high-Tc superconductivity in iron pnictides is associated with both the presence of high-energy spin excitations and a coupling between low-energy spin excitations and itinerant electrons.

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