

*Coexistence of superconductivity and ferromagnetism in Eu-based Fe pnictides*

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Superconductivity and magnetism are two antagonistic phenomena since the superconducting state expels external magnetic flux. However, using x-ray resonant magnetic scattering, polarized and unpolarized neutron diffraction techniques, we show that the superconductivity and ferromagnetism coexists in the Co, Ir, and P-doped Eu based "122" Fe-pnictides. Our neutron diffraction results show that the Eu moments are ferromagnetically aligned along the c direction in the superconducting state with an ordered moment close to the saturation moment of the Eu<sup>2+</sup>. We expect a spontaneous vortex state to account for the compromise between the two competing phenomena.

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