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Double magnetic resonance and spin anisotropy in Fe-based superconductors due to static and fluctuating antiferromagnetic orders WEICHENG LV, ADRIANA MOREO, ELBIO DAGOTTO, University of Tennessee and Oak Ridge National Laboratory — Motivated by recent neutron scattering experiments in Fe-based superconductors, we study how the magnetic resonance in the superconducting state is affected by the simultaneous presence of either static or fluctuating magnetic orders using the random phase approximation. We find that for the underdoped materials with coexisting superconducting and antiferromagnetic orders, spin rotational symmetry is explicitly broken at the ordering momentum $\mathbf{Q_1} = (\pi, \mathbf{0})$. Only the longitudinal susceptibility exhibits the resonance mode, whereas a spin-wave Goldstone mode develops in the transverse component. Meanwhile, at the frustrated momentum $\mathbf{Q_2} = (\mathbf{0}, \pi)$, the susceptibility becomes isotropic in spin space and the magnetic resonance exists for both components. Furthermore, the resonance energies at $\mathbf{Q_1}$ and $\mathbf{Q_2}$ have distinct scales, which provides a natural explanation for the recently observed double resonance peaks. In addition, we show that near optimal doping the existence of strong magnetic fluctuations, which are modelled here via a Gaussian mode, can still induce the spin anisotropy in the magnetic susceptibility.

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