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The spin resonance of $CeCoIn_5$: A dynamical precursor of the Q-Phase

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The concept of soft mode is central to condensed matter physics; it emphasizes the relationship between the excitation spectrum and the ground state of different phases of matter in a variety of situation ranging from lattice dynamical instability in ferroelectrics to Bose-Einstein condensation of magnons in magnetic insulators. Unconventional superconductivity often occurs on the verge of magnetic ordering or charge density-wave formation asking the question whether these states of matter are competitive or collaborative phases. Unconventional superconductivity modifies the magnetic excitation spectrum of a metal by a feedback effect corresponding to the apparition of a new collective mode, the spin resonance. It was recently shown by detailed inelastic neutron scattering experiments performed on the model *d*-wave unconventional superconductor $CeCoIn_5$ that the spin resonance mode has the same symmetry [1] as the adjacent field induced magnetic ordered phase, the Q-phase [2]. This fact, together with the known softening of the dynamical mode under applied magnetic field [3,4], strongly supports a scenario where the static magnetic order is realized by a condensation of the superconducting spin resonance. [1] S. Raymond and G. Lapertot, Phys. Rev. Lett. 115, 037001 (2015). [2] M. Kenzelmann et al., Science, 321, 1652 (2008). [3] C. Stock et al., Phys. Rev. Lett. 109, 167207 (2012). [4] S. Raymond et al., Phys. Rev. Lett. 109, 237210 (2012).