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Field Induced Suppression of the Resonance Mode in N-type High-T_c Cuprate $Pr_{.88}LaCe_{.12}CuO_{4-\delta}$ (T_c=24K)[1]

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We discuss the results of our recent inelastic neutron scattering experiments probing the magnetic field dependence of the resonance mode in an electron-doped high-T_c cuprate. The resonance mode in the high-T_c superconductors is a magnetic excitation widely believed to be fundamentally connected to the superconducting mechanism. The mode itself appears only below T_c in optimally-doped cuprates, and its characteristic energy follows the universal relation $E_{Resonance}$=5.8$k_B T_c$ in all classes of cuprate systems. Using a c-axis aligned magnetic field, superconductivity in the electron-doped cuprate, $Pr_{.88}LaCe_{.12}CuO_{4-\delta}$ (PLCCO), can be completely suppressed with an experimentally realizable field of ∼9 T at 2 K. This fact combined with the recent discovery of the resonance mode in this PLCCO system, allows, for the first time, an experimental observation of the evolution of the resonance mode as a cuprate system is driven into its field-suppressed ground state. We will present such a study in a nearly optimally-doped sample of PLCCO (T_c=24K). The simultaneous emergence under field of static antiferromagnetic (AF) order at the commensurate AF ordering wavevector will also be discussed along with the influence of a c-axis field on low energy excitations in this system. Changes in magnetism coupled to the suppression of the superconducting phase in this PLCCO system will be given particular focus.

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