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Enhancement of strong coupling s-wave superconductivity in the vicinity of a quantum critical point in $(Ca,Sr)_3Rh_4Sn_{13}$

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We report muon spin rotation (μSR) studies of the superconducting properties as a function of chemical and hydrostatic pressure on the cubic ternary intermetallic $(Ca_xSr_{1-x})_3Rh_4Sn_{13}$ compounds, which feature strong coupling phonon-mediated BCS superconductivity and a structural phase transition a critical pressure p_c associated with a charge density wave (CDW) formation [1]. A strong enhancement of the superfluid density and a pronounced maximum in the pairing strength provide evidence of a quantum critial point at p_c, which separates a superconducting phase coexisting with CDW from a pure superconducting phase. In both phases superconductivity has a phonon-mediated BCS s-wave character. Together with the related isoelectronic compound $Ca_3Ir_4Sn_{13}$ [2], this system shows that conventional BCS superconductors in the presence of competing orders may display behavior and characteristics of unconventional superconductors.

[1] S. K. Goh, et al., Phys. Rev. Lett. 114, 097002 (2015)
[2] P. K. Biswas, et al., Phys. Rev. B 92, 195122 (2015)

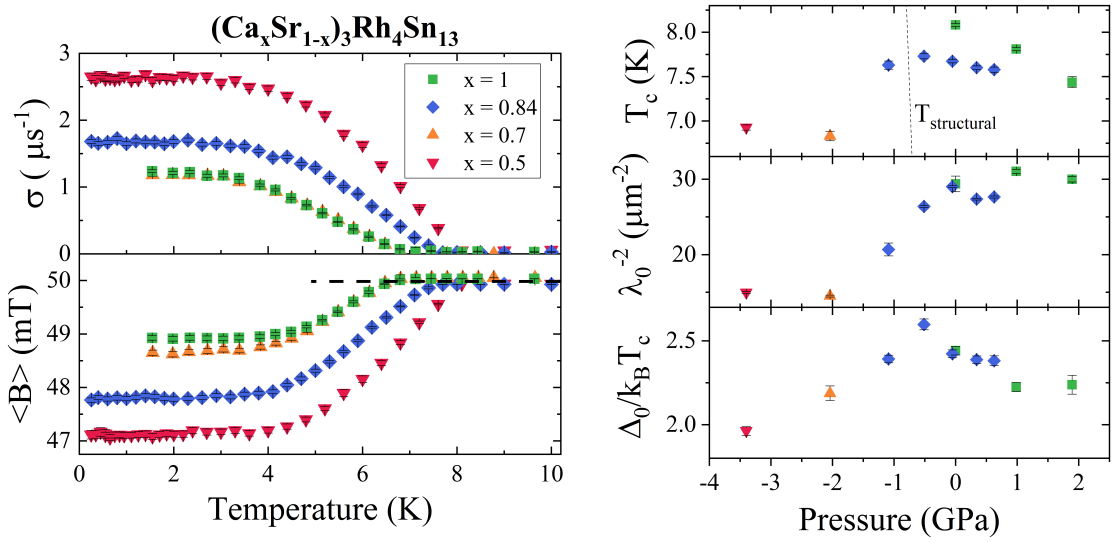

Figure 1: (a) Depolarization rate and center field as a function of temperature at ambient pressure for different chemical compositions. (b) Superconducting state parameters as a function of combined chemical and hydrostatic pressure.

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