Evolution of pseudogap phase under pressure and end point of CDW in Nd-LSCO probed by transport measurements

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In cuprate superconductors, one of the most mysterious phase is the Pseudogap. Particularly, while it seems linked to the superconducting dome, the nature of the connection between the two remains unknown. It has been shown that it onsets at a doping p^* and is characterized by a drop in carrier density n from $n = 1 + p$ above p^* to $n = p$ below. In resistivity and Hall effect, this is observed as an upturn at low temperature in both quantities[1,2]. In $Nd_{0.4}La_{1.6-x}Sr_xCuO_4$ (Nd-LSCO), at ambient pressure, $p^* = 0.23$. A recent study from our group showed that by applying hydrostatic pressure, one can suppress the pseudogap in Nd-LSCO and move p^* to a lower doping[3]. At a doping p=0.22, the upturns in resitivity and Hall effect are fully suppressed by the application of 2 GPa of pressure. The underlying mechanism for this effect is rooted in the Fermi Surface, which imposes the constraint that the Pseudogap cannot open on an electron-like Fermi surface. Here we present a confirmation of these results, by means of thermoelectric power and Nernst effect measurements under pressure up to 2 GPa and in high magnetic fields up to 31.2 T. In both quantities, the increase due to the Pseudogap opening on the Fermi Surface is strongly suppressed by pressure at p=0.22, while it has only a very weak effect at p=0.24, which further supports our interpretation that pressure tunes the pseudogap critical point p^* to lower dopings in Nd-LSCO.

[1] S. Badoux et al., Nature 531, 210 (2016)
[2] C. Collignon et al., Phys. Rev. B 95, 224517 (2017)
[3] N. Doiron-Leyraud et al., Nat. Commun. 8, 2044 (2017)