Electronic nematic softening in cuprate superconductors probed by resonant ultrasound spectroscopy measurements

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Electronic-nematic order has been shown to be the driver of the structural and magnetic transitions in the Ba-pnictide superconductors. For cuprate superconductors, the determination of the existence of long-range electronic-nematic order and fluctuations is not as clearly established as for the pnictides. In this talk I will present Resonant Ultrasound Spectroscopy (RUS) measurements in single crystals of $La_{2-x}Sr_xCuO_4$ of different Sr compositions, through which we have determined the temperature dependence of all elastic moduli in the tetragonal phase of this compound. A strong softening of the C_{66} elastic shear moduli, associated with the B_{2g} symmetry channel, is observed as temperature is decreased, even for the compositions for which the tetragonal to orthorhombic structural transition is not seen. The temperature dependence of this softening is consistent with a Curie-like temperature dependence, $1/(T-T_0)$. The B_{2g} softening is truncated by the opening of the superconducting gap at $T_c>T_0$, evidenced by the stiffening of C_{66} below T_c. These observations suggest an electronic nematic origin for this softening.