

Etude par ultrasons de supraconducteurs à base de lanthane en champs magnétiques intenses

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Lanthanum based cuprate superconductors are highly correlated electrons systems well-know for their structural, magnetic, charge and superconducting instabilities. In underdoped compound (i.e. for doping less than optimal for superconductivity) a dip in the onset temperature for superconductivity T_c , centered at $p \sim 0.125$, occurs, known as the "1/8 problem". While the origin of this dip is still under debate, most of the experimental evidence in $La_{2-x}Sr_xCuO_4$ (LSCO) seems to point toward a competition with frozen magnetism¹ whose onset temperature is higher when superconducting T_c is lower.

In order to further investigate the relationship between magnetism and superconductivity we have performed measurements of ultrasonic velocity and attenuation in LSCO. Around $p=1/8$, several anomalies are observed in the sound velocity and attenuation, associated with superconductivity and magnetic freezing. The competition between the two orders parameters is tuned with a magnetic field which enhances magnetic correlations at the expense of superconductivity².

[1] M. H. Julien, Physica B 329-333 (2000) 693.

[2] J. Chang, et al., Phys. Rev. B 78 (2008) 104525.