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| | **Experiment title:**<br>La0.7Sr0.3MnO3 – a polaronic metal? | **Experiment number**:<br>HC-1701 |
| **Beamline**:<br>ID28 | **Date of experiment**:<br>from: 24.09.14 to: 30.09.14 | **Date of report**:<br>01.08.216 |
| **Shifts:**<br>18 | **Local contact(s)**:<br>Alexei Bosak | *Received at ESRF:* |

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## Report:

## Abstract [Maschek et al., Phyical Review B 93, 045112 (2016)]:

Among colossal magnetoresistive manganites the prototypical ferromagnetic manganite $La_{0.7}Sr_{0.3}MnO_3$ has a relatively small magnetoresistance, and has been long assumed to have only weak electron-lattice coupling. Here we report that $La_{0.7}Sr_{0.3}MnO_3$ has strong electron-phonon coupling: Our neutron and x-ray scattering experiments show strong softening and broadening of transverse acoustic phonons on heating through the Curie temperature $T_C = 350\,\mathrm{K}$. Simultaneously, we observe two phases where metallic resistivity and polarons coexist. The ferromagnetic polaronic metal phase between $200\,\mathrm{K}$ and $T_C$ is characterized by quasielastic scattering from dynamic CE-type polarons with the relatively short lifetime of $\tau \approx 1\,\mathrm{ps}$. This scattering is greatly enhanced above $T_C$ in the paramagnetic polaronic metal phase. Our results suggest that the strength of magnetoresistance in manganites scales with the inverse of polaron lifetime, not the strength of electron-phonon coupling.