

Abstract Submitted
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Nyquist noise as probe of hot-electron effects in the ferromagnetic insulating state of manganites¹ SUDESHNA SAMANTA, ARUP K. RAY-CHAUDHURI, S. N. Bose Centre, Block-JD, Sector-3, Salt-Lake, Kolkata-98, India — Hole-doped rare-earth manganites (like $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$) in the ferromagnetic insulating (FMI) state show large non-linear conductance. Such non-linear conductance can arise due to hot-electron effect which originates from decoupling of the electron and lattice temperatures at high power level. The non-linear conductance manifests as electro-resistance or current induced resistance change. We report here low frequency temperature dependent noise measurement which allows us to estimate the electronic temperature by measuring Nyquist noise (“white noise” in contrast to $1/f$ noise) in $\text{La}_{0.8}\text{Ca}_{0.2}\text{MnO}_3$ single crystals which has a distinct FMI state below 100K. The measurement was performed with low ac biasing current which was mixed with a high current density d.c that leads to electron heating. We observed that in the insulating state, above a certain input d.c power, the Nyquist noise increases by a large extent and this is coupled to the onset of non-linear conduction as signalled by the power dependence of the differential conductance. The experiment establishes a direct link between hot-electron effect and non-linear conductance.

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