Noise spectroscopy: a sensitive probe to explore hot electron effect in highly correlated systems\textsuperscript{1} \textsc{Sudeshna Samanta, Arup k. Ray-Chaudhuri, S N Bose National Centre for Basic Sciences, Block-JD, Sector-3, Salt Lake, Kolkata, India} — Non-linear electrical conductance in ferromagnetic insulating (FMI) state of manganites can give rise to reversible colossal electro-resistance and current induced resistance change due to heating of the electrons in the system. In FMI state (<120K), the temperature of the lattices or phonon ($T_{ph}$) and electrons ($T_e$) in the sample can decouple by high input power density giving rise to heating of the electronic bath. We investigated whether white noise like Nyquist noise can be used to measure $T_e$ (which is expected to be larger than $T_{ph}$) when the two baths get decoupled. The use of the Nyquist noise to measure $T_e$ assumes that the electron bath forms a proper temperature bath in equilibrium. A dc stressing current was used to heat the electron bath while a small ac signal was used to measure the noise. With enhanced power input to the electron system, the white noise enhances and there is a large deviation from the simple estimate of Nyquist relation ($4k_BT_e R_{sample}$) indicating that the electron system is not in thermal equilibrium and is a non-ergodic system where Fluctuation Dissipation Theorem has broken down.

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