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Detrended Fluctuation Analysis for Dynamics in an Electron Glass[1] STEPHEN ARNASON, University of Massachusetts Boston — As a result of the correlations between electrons, electron glasses show enhanced fluctuations in coductance with a $1/f^{\alpha}$ frequency dependence. We are interested in looking at the time dependence of the fluctuation spectra as the system relaxes towards equilibrium after a discontinuous change in chemical potential. Our measurements are taken on FET structures where the conductance channel is fabricated from amorphous Indium Oxide with stoichiometry close to the superconductor to insulator transition. Changing the potential on the gate electrode allows us to change the chemical potential and we measure the resistance of the conductance channel as a function of time. In addition to the fluctuations there is a slow, logarithmic relaxation of the channel conductance. Because of this slow relaxation it is hard to characterize our signal as stationary, calling into question the application of Fourier transform based analysis techniques. One approach to coping with this problem is the subtraction of the slowly varying background before the calculation of the Fourier transforms, so called detrended fluctuation analysis. This paper presents results on simulations of this technique as applied to computer generated signals with characteristics similar to our actual data. The frequency dependence of the fluctuation spectra is imperfectly preserved but can be similar to the actual fluctuation spectra within certain bounds of analysis parameters.

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