Universal critical slowing down of the electron dynamics near the Mott transition in the organic superconductors κ-(BEDT-TTF)$_2$X

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As model systems for studying the physics of correlated electrons and the Mott metal-insulator transition (MIT) in reduced dimensions, the quasi-2D organic charge-transfer salts κ-(BEDT-TTF)$_2$X, where X denotes polymeric anions, become increasingly important. In this work, we focus on the anomalous metallic state in the vicinity of the critical endpoint of the Mott transition. Systematic studies of low-frequency fluctuation spectroscopy[1] of materials located at different positions in the temperature-pressure phase diagram reveal a correlation-induced enhancement of the resistance noise power spectral density S_R in the critical region of the phase diagram. We employ a theoretical model that quantitatively describes the temperature and frequency dependence of the normalized noise power S_R/R^2. We find that very near the Mott critical endpoint the resistance fluctuations are strongly enhanced, accompanied by a substantial shift of spectral weight to low frequencies. We interpret this as a sudden slowing down of the electrons' dynamics when approaching the critical point, and onset of non-Gaussian behavior at the MIT. A comparison with MIT's in other systems suggests that correlated electron dynamics might be a universal feature, irrespective of the system's dimensionality.

[1]J. Müller, ChemPhysChem **2011**, 12.