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Random telegraph signal and low frequency noise in molecular tunnel junctions DOMINIQUE VUILLAUME, NICOLAS CLEMENT, DAVID GUERIN, STEPHANE PLEUTIN, IEMN-CNRS, DAVID CAHEN, Weizmann Institute — Monolayers of organic molecules present one of the main systems studied in molecular electronics. We report the observation and study of a low frequency noise and Random Telegraph Signal (RTS) in self-assembled alkyl chain junctions on silicon. The 2 levels of current can be clearly distinguished. With a sufficiently long recording time (> 500 events), statistics can be performed on the current level and on the upper and lower times. The RTS amplitude is usually few % of the average current and the process follows poissonian statistics. This RTS signal is also modulated by another RTS with a much longer time constant. This allowed us evaluation of the change of noise in the frequency domain from 1/f noise to Lorentzian like spectrum. In inorganic tunnel junctions, such signal can only be observed in submicrometric junctions whereas we observe it in almost millimetric junctions. This precludes mechanisms involving electron trapping / detrapping in single isolated trap. We propose several hypotheses leading to long-range fluctuations including molecular dynamics and relaxation processes.

Dominique Vuillaume
IEMN-CNRS

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