Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Charge noise in liquid-gated single-wall carbon-nanotube transistors JAAN MANNIK, IDDO HELLER, ANNE JANNSENS, SERGE LEMAY, CEES DEKKER, Delft University of Technology — Inherent electrical noise determines the performance limits of single-wall carbon nanotube transistors (SWNT-FETs) for various applications such as biosensors or components of electronic circuits. Recently, several models have emerged for the noise properties of SWNT-FETs. Here, we aim to verify these models by studying the gate- voltage dependence of noise in SWNT-FETs. We use electrolytic solutions as a gate electrode to be able to map out extensive range of gate voltages. Our data are in contrast with the Hooge's model but support a recently proposed model where noise power is proportional to the square of the derivative of current with respect to gate voltage, i.e. charge noise model. Furthermore, we find that the charge noise scales approximately as the inverse of the length of the SWNT, down to lengths where ballistic transport of charge carriers through SWNT is expected. Our measurements also show that the salt concentration of the electrolyte has a minimal effect on the magnitude of noise in SWNT-FETs.

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Date submitted: 12 Dec 2007 Electronic form version 1.4