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RC Transmission Line Characterization of Organic Semiconductors[1] DANIEL LENSKI, ADRIAN SOUTHARD, MICHAEL S. FUHRER, Department of Physics and Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD 20742, USA — We have characterized thin films of organic semiconductors (pentacene and poly-3-hexylthiophene) using a 3-contact transmission line configuration, in which an AC voltage is applied between the thin film and the gate, and the phase and magnitude of the current are measured. We compare the results with those obtained from simultaneous DC measurement, and find good agreement in the sheet resistance in the ON state measured using the DC and transmission line techniques, indicating that the transmission line technique is useful for obtaining sheet resistance and mobility in the ON state. Near threshold, or at high frequencies and electric fields, we observe systematic deviations of the AC impedance from the DC values. We discuss these deviations in terms of the of frequency-dependent length scale probed by the transmission line technique, and how these measurements can shed light on the properties of the semiconductor materials as well as their interfaces with contacts and substrates.

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