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Surface Potentials and Layer Charge Distributions in Few-Layer Graphene¹ SUJIT DATTA, DOUGLAS STRACHAN, EUGENE MELE, A.T. CHARLIE JOHNSON, Department of Physics and Astronomy, University of Pennsylvania — Elucidating the electronic interaction between an insulating substrate and few-layer graphene (FLG) films is crucial for graphene device applications. We have performed electrostatic force microscopy (EFM) of FLG films. Our measurements reveal that the FLG surface electrostatic potential increases with film thickness, approaching a ‘bulk’ value for samples with five or more graphene layers - contrasting sharply with behavior expected for conventional conducting or semiconducting films. This is in quantitative agreement with the analytic predictions of a nonlinear Thomas-Fermi theory of the interlayer screening by graphene’s relativistic low energy charge carriers. Furthermore, our measurements are able to resolve previously unseen electronic perturbations extended along crystallographic directions of stressed samples, likely resulting from long-range atomic defects.

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