Abstract Submitted
for the TSF05 Meeting of
The American Physical Society

Scaling of the Step Position Distribution of Stepped Crystal Surfaces[1] HOWARD L. RICHARDS, AMBER N. BENSON[2], Physics, Texas A&M University-Commerce, T.L. EINSTEIN, Physics, University of Maryland, College Park — Both Monte Carlo simulations and Scanning Tunneling Microscope images of stepped crystal surfaces can only include some finite length, Δy, along average direction of steps. This has important consequences, because the variance of the Step Position Distribution (SPD), $\sigma_Q^2(\Delta y)$, calculated from these "snapshots" depends on Δy. For $\Delta y < \xi_Q$, where ξ_Q is the correlation length of the steps, $\sigma_Q^2(\Delta y) \propto (\Delta y)^{0.8}$; for $\Delta y > 4\xi_Q$, $\sigma_Q^2(\Delta y)/\sigma_{Q,\mathrm{W}}^2 \approx 0.158 + 0.318 ln(\Delta y)$, where $\sigma_{Q,\mathrm{W}}^2$ is the finite value of $\sigma_Q^2(\infty)$ predicted by the two-step approximation which yields the generalized Wigner distribution (GWD) for the Terrace Width Distribution (TWD). A "Wigner length", L_W, can be defined by $\sigma_Q^2(L_\mathrm{W}) = \sigma_{Q,\mathrm{W}}^2$. It appears that $L_\mathrm{W} \approx 14.2\xi_Q$ independent of the magnitude of step interaction. This is very close to a length which must be introduced to reproduce the GWD from an ensemble averge of Gruber-Mullins approximations of the TWD.

[1]Supported by a Cottrell College Science Award from Research Corporation.
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Date submitted: 26 Sep 2005 Electronic form version 1.4