

Abstract Submitted
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Debye Model of Steps on Vicinal Crystal Surfaces¹ HOWARD L. RICHARDS, CLINT A. GREENE, Texas A & M University-Commerce — The steps on a vicinal crystal surface can be mapped onto the world lines of spinless fermions, with the average direction of the steps (the y -direction) being mapped to time. If the interaction energy per unit length between neighboring steps is given by $V(L) = A/L^2$ (as is common), this resulting quantum system is integrable for only three values of $\tilde{A} \equiv \tilde{\beta}A/(k_B T)^2$. For other values of \tilde{A} , the Pairwise Einstein Model gives an excellent approximation for the Terrace Width Distribution (TWD, the histogram of $x_{i+1}(y) - x_i(y)$) but is severely limited in describing $g_x(\Delta y) \equiv \langle [x_i(y + \Delta y) - x_i(y)]^2 \rangle$, particularly for $\Delta y > \xi$, the correlation length. Here we show how the one-dimensional Debye model correctly gives $g_x(\Delta y)$ even for large Δy . The Pairwise Einstein Model also suggests a relationship between the compressibility of the steps and the tails of the TWD, a relationship we clarify using the Debye model.

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