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**Anisotropic Exponents for Avalanche Correlation Lengths in Self-Affine Growth of Magnetic Domains**[1] JOEL CLEMMER, MARK ROBBINS, Johns Hopkins University — Driven interfaces in a wide variety of systems undergo a critical depinning transition as the driving force is increased to a critical value, $F_c$. Near this transition, growth consists of discrete avalanches with a power law distribution of sizes and a diverging length scale along the interface $\xi_{\|} \sim |F_c - F|^{\nu_{\|}}$. Scaling theories often assume that correlations perpendicular to the interface diverge with an exponent $\nu_{\perp} = \alpha\nu_{\|}$, where $\alpha$ is the self-affine roughness exponent [2]. We simulate depinning of a self-affine domain wall in the 3D random field Ising model to determine the ratio $\chi \sim \nu_{\perp}/\nu_{\|}$. Analyzing individual avalanches show that the height $l_{\perp}$ and width along the interface $l_{\|}$ scale as $l_{\perp} \sim l_{\|}^{\chi}$ with $\chi = 0.9 \pm 0.05$ over 3 decades in systems of $10^{10}$ spins. This value of $\chi$ is significantly greater than $\alpha \sim 0.67$. Finite size scaling was used to confirm the value of $\chi$. The probability of reaching the top of a system of width $L$ and height $L^{\chi}$ as a function of $|F - F_c|L^{1/\nu_{\|}}$ collapses for $\chi = 0.9 \pm 0.03$. We discuss the implications for other scaling relations and the conditions where $\chi$ and $\alpha$ should differ.

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[2]O. Narayan, D. Fisher PRB 82 (1993)

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