Ashkin-Teller criticality and pseudo-first-order behavior in a frustrated Ising model on the square lattice[1] SONGBO JIN, ARNAB SEN, ANDERS SANDVIK, Boston University — We consider the square-lattice frustrated Ising model with first- and second-neighbor interactions, $J_1 < 0$ and $J_2 > 0$. Its thermal phase transition to "stripe" order when $g = J_2/|J_1| > 1/2$ has remained controversial despite many past studies. Using Monte Carlo simulations to investigate the order-parameter distribution and its Binder cumulant, we demonstrate Ashkin-Teller criticality for $g \geq g^*$, i.e., the critical exponents vary continuously between those of the 4-state Potts model at g^* and the Ising model for $g \to \infty$. The Potts point, below which the transition is first-order, is $g^* = 0.67 \pm 0.01$, much lower than previously believed. The system exhibits *pseudo first-order* behavior for $g^* \leq g \leq g'$ ($g' \approx 0.9$), which was previously misinterpreted as actual first-order behavior.

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