Dimerized Bond-Disordered Quantum Spin Models and Harris Criterion JONAS GUSTAFSSON, Goldman Sachs, DAOXIN YAO, ERICA CARLSON, Purdue University, ANDERS W. SANDVIK, Boston University — We study several different realizations of dimerized bond disorder in the two-dimensional square-lattice S=1/2 Heisenberg model, by introducing strong and weak couplings, J_s, J_w, randomly, but in such a way that each spin belongs to one strong bond (a dimer). We study the ground-state phase transition occurring at a critical ratio $g_c = J_s/J_w$ for different ways of distributing the dimers: (a) randomly distributed as in the classical dimer model, whence the dimer-dimer correlation function follows a power law, $c(r) \sim r^{-2}$, and (b) the random plaquette (RP) model, where all dimers are first placed horizontally in columns and thereafter any plaquette with dimers is flipped with probability $p = 1/2$ or $1/4$. Our calculations show that the Harris criterion for the relevance of disorder is not applicable to these models. In all cases, the disorder does not appear to change the universality class from that obtaining with a regular dimer arrangement.

Daoxin Yao
Purdue University