Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Random Regular Networks with Distance-limited Interdependent Links STEVEN LOWINGER, YOSEF KORNBLUTH, GABRIEL CWILICH, SERGEY BULDYREV, Yeshiva University Department of Physics — We study the mutual percolation of a system composed of two interdependent random regular networks. We introduce a notion of distance, d, to explore the effects of the proximity of interdependent nodes on the cascade of failures after an initial attack. The nature of the transition through which the networks disintegrate depends on the parameters of the system, which are the degree of the nodes and the maximum distance between interdependent nodes. As the distance and degree increase, the collapse at the critical threshold changes from a second-order transition to a first-order one. The critical threshold monotonically increases with distance. We find a transitional case, in which a novel type of phase transition appears. The case $d = 1$ can be completely solved analytically and it maps into a discrete version of the Rényi parking problem [1].

[1] A. Rényi, Publ. Math. Inst. Hung. Acad. Sci. 3, 109-127(1958).

Steven Lowinger
Yeshiva University Department of Physics

Date submitted: 15 Nov 2013 Electronic form version 1.4