Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Phase transition of biconnected components in scale-free networks PURIN KIM, Department of Physics and Astronomy, Seoul National University, DEOK-SUN LEE, Department of Natural Medical Sciences and Department of Physics, Inha University, BYUNGNAM KAHNG, Department of Physics and Astronomy, Seoul National University — In information-transport and biological systems, there can be more than one pathway between two nodes, so that there is a backup in case one pathway is inactive. The size of such biconnected nodes can be an important measure of the robustness of a system. The giant biconnected components of diverse real-world networks suggest the importance of scale-free topology in the biconnectivity. Thus, here, we consider a critical behavior of the largest biconnected component as links are added and form a random scale-free network. The critical exponents $\beta_{(\mathrm{BC})}$ and $\beta_{(\mathrm{SC})}$ associated with the order parameter of the percolation transition of biconnected and single-connected components, respectively, are compared. We obtain that $\beta_{(\mathrm{BC})}/\beta_{(\mathrm{SC})} = \lambda - 1$ for $2 < \lambda < 3$ and 2 for $\lambda > 3$, where λ is the exponent of the degree distribution in scale-free networks. We also obtain the finite-size scaling behavior of the order parameter analytically and numerically.

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Date submitted: 09 Nov 2012 Electronic form version 1.4