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Graphicality of random scale-free networks with general degree cutoffs YONGJOO BAEK, DANIEL KIM, Department of Physics, KAIST, MEESOON HA, Department of Physics Education, Chosun University, HAWOONG JEONG, Department of Physics, KAIST — We study graphicality of random scale-free networks with arbitrary degree cutoffs in the thermodynamic limit, which refers to realizability of degree sequences randomly generated with the degree exponent γ and the upper degree cutoff k_c as the number of nodes N goes to infinity. While a recent study[1] found that only degree sequences with $\gamma > 2$ or $\gamma < 0$ are graphical if $k_c = N - 1$ using the graphicality criterion proved by Erdös and Gallai,[2] we generalize the study to different upper cutoffs. To ensure graphicality of degree sequences, it is found that the upper cutoff must be lower than $k_c \sim N^{1/\gamma}$ for $\gamma < 2$, whereas any upper cutoff is allowed for $\gamma > 2$. This is also numerically verified, using both random and deterministic sampling of degree sequences. Our result can be interpreted as giving a fundamental constraint on the structure of random scale-free networks.

[1]C. I. Del Genio, T. Gross, and K. E. Bassler, Phys. Rev. Lett. **107**, 178701 (2011).
[2]P. Erdös and T. Gallai, Matematikai lapok **11**, 264 (1960).

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