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**Influence of spatial dependence on the eigenvalue spectrum of complex networks** JORIS BILLEN, MARK WILSON, ARLETTE R.C. BALJON, San Diego State University, San Diego CA 92182, AVINOAM RABINOVITCH, Ben-Gurion University, Beer-Sheva 84105, Israel — Many real life networks are known to exhibit a spatial dependence (SD), i.e. the probability to form a link between two nodes in the network, inversely depends on the distance between them. We investigate the influence of SD on the eigenvalue spectrum of networks. By increasing the SD in Erdős Rényi (ER), scalefree, and small-world networks we find that the eigenvalue spectrum becomes asymmetric, as a result of the increased clustering in the system. We quantify this asymmetry by the skewness, kurtosis, and the change in highest and lowest eigenvalues of the spectrum as a function of SD. Our results show that the eigenvalue spectrum can be used as a tool to detect SD in real-life networks. We illustrate this ability for the eigenvalue spectrum of a spatial dependent polymeric gel.

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