Impact of Single Links in Growing Networks — Jan Nagler¹,² and Marc Timme¹,²,³

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How a complex network is connected crucially impacts its dynamics and function. Until recently, random percolation processes were thought to exhibit continuous transitions in general. Numerical evidence for discontinuous changes of the order parameter in certain percolation processes, however, has triggered an ongoing scientific controversy about the conditions for discontinuous phase transitions in percolation [Achlioptas, D’Souza, and Spencer, Science 323, 1453 (2009); Nagler, Levina, and Timme, Nature Physics, in press; see also references therein.]. We study both numerically and analytically under which conditions certain “competitive” percolation processes exhibit macroscopic jumps in the order parameter.