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Self-assembly of the yeast actomyosin contractile ring as an aggregation process: kinetics of formation and instability regimes[1] NIKOLA OJKIC, DIMITRIOS VAVYLONIS, Department of Physics, Lehigh University — Fission yeast cells assemble an equatorial contractile ring for cytokinesis, the last step of mitosis. The ring assembles from ~ 65 membrane-bound "nodes"' containing myosin motors and other proteins. Actin filaments that grow out from the nodes establish transient connections among the nodes and aid in pulling them together in a process that appears as pair-wise attraction (Vavylonis et al. Science 97:319, 2008). We used scaling arguments, coarse grained stability analysis of homogeneous states, and Monte Carlo simulations of simple models, to explore the conditions that yield fast and efficient ring formation, as opposed to formation of isolated clumps. We described our results as a function of: number of nodes, rate of establishing connections, range of node interaction, distance traveled per node interaction and broad band width, w. Uniform cortical 2d distributions of nodes are stable over short times due to randomness of connections among nodes, but become unstable over long times due to fluctuations in the initial node distribution. Successful condensation of nodes into a ring requires sufficiently small w such that lateral contraction occurs faster then clump formation.

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