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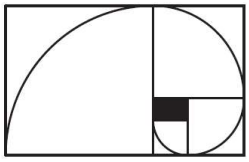

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# Boundary driven Markov gas: duality and scaling limits

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**Abstract.** Inspired by the recent work of Bertini and Posta [5], who introduced the boundary driven Brownian gas on $[0,1]$, we study boundary driven systems of independent particles in a general setting, including particles jumping on finite graphs and diffusion processes on bounded domains in $\mathbb{R}^d$. We prove duality with a dual process that is absorbed at the boundaries, thereby creating a general framework that unifies dualities for boundary driven systems in the discrete and continuum setting. We use duality first to show that from any initial condition the systems evolve to the unique invariant measure, which is a Poisson point process with intensity the solution of a Dirichlet problem. Second, we show how the boundary driven Brownian gas arises as the diffusive scaling limit of a system of independent random walks coupled to reservoirs with properly rescaled intensity.

**Keywords.** Boundary driven systems, Brownian gas, duality, orthogonal polynomials, point processes, scaling limits.

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