Spectral analysis of Brownian motion with jump boundary

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Abstract: Consider a family of probability measures $\{\mu_y : y \in \partial D\}$ on a bounded open domain $D \subset \mathbb{R}^d$ with smooth boundary. For any starting point $x \in D$, we run a a standard d-dimensional Brownian motion $B(t) \in \mathbb{R}^d$ until it first exits D at time τ, at which time it jumps to a point in the domain D according to the measure $\mu_{B(\tau)}$ at the exit time, and starts the Brownian motion afresh. The same evolution is repeated independently each time the process reaches the boundary. The resulting diffusion process is called Brownian motion with jump boundary (BMJ). The spectral gap of non-self-adjoint generator of BMJ, which describes the exponential rate of convergence to the invariant measure, is studied. The main analytic tool is Fourier transforms with only real zeros.