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Quantum master equation in phase space: Application to the Brownian motion in a periodic potential[1] WILLIAM COFFEY, Dept. Electronic and Electrical Engineering, Trinity College, Dublin 2, Ireland, YURI KALMYKOV, MEPS, Université de Perpignan, 52 Av. Paul Alduy, 66860 Perpignan Cedex, France, SERGEY TITOV, Inst. Radio Engineering and Electronics of the Russian Academy of Sciences, Vvedenskii Square 1, Fryazino, Moscow Region, 141190, Russia, BERNARD MULLIGAN, Dept. Electronic and Electrical Engineering, Trinity College, Dublin 2, Ireland — The quantum Brownian motion of a particle in a periodic potential $V(x) = -V_0 \cos(x/x_0)$ is treated using the master equation for the time evolution of the Wigner distribution function $W(x, p, t)$ in phase space (x, p). Explicit equations for the diffusion coefficients of the master equation for this dissipative quantum system are derived. The dynamic structure factor and longest relaxation time are evaluated by using matrix continued fractions. The longest relaxation time so obtained is compared with the quantum-mechanical escape rate formula. The matrix continued fraction solution agrees well with the analytical solution of the corresponding Kramers turnover problem.

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