Initial distribution

$$\rho^{(\mathrm{I})}(\vec{q},\vec{p}) = \frac{1}{(\pi\hbar)^N}\exp\left(-\tfrac{2}{\hbar}W(\vec{q},\vec{p})\right),$$

$$W(\vec{q},\vec{p}) = \frac{1}{2}\sum_{i=1}^{N}\left(\frac{1}{\omega_i}p_i^2 + \omega_i q_i^2\right)$$

Final distribution

$$\rho_E^{(\mathrm{F})}(\vec{q},\vec{p}) = \delta\left(E - H^{(\mathrm{F})}(\vec{q},\vec{p})\right)$$

Transition rate

$$I(E) = \frac{1}{(\pi\hbar)^N}\int_{H^{(\mathrm{F})}(\vec{q},\vec{p})=E} d\vec{q}\,d\vec{p}\exp\left(-\tfrac{2}{\hbar}W(\vec{q},\vec{p})\right)$$

Jumping point (q^*, p^*)

$W(\vec{q},\vec{p})$ minimal under constraint $H^{(\mathrm{F})}(\vec{q},\vec{p}) = E$.

$$\vec{\nabla}W(\vec{q}^{\,*},\vec{p}^{\,*}) = \lambda\vec{\nabla}H^{(\mathrm{F})}(\vec{q}^{\,*},\vec{p}^{\,*})$$

Result of integration around (q^*, p^*)

$$I(E) = \frac{f_0^*}{H_1}\left(\pi\hbar\,\mathrm{Det}\,\mathbf{F}\right)^{-1/2}\exp\left(-\tfrac{2}{\hbar}W^*\right)$$

$$f_0^* = f_0(\vec{q}^{\,*},\vec{p}^{\,*}),\quad W^* = W_0(\vec{q}^{\,*},\vec{p}^{\,*}),$$

$$H_1 = \left|\vec{\nabla}H(\vec{q}^{\,*},\vec{p}^{\,*})\right|,\quad F_{ij} = \frac{\partial^2}{\partial\xi_{i+1}\partial\xi_{j+1}}(W - \lambda H)$$

Logarithm of the rate

$$I = \exp\left(-\tfrac{2}{\hbar}w\right),$$

$$w = W^* - \tfrac{\hbar}{2}\ln\left(\left(\pi\hbar H_1^2\,\mathrm{Det}\,\mathbf{F}\right)^{-1/2} f_0^*\right)$$