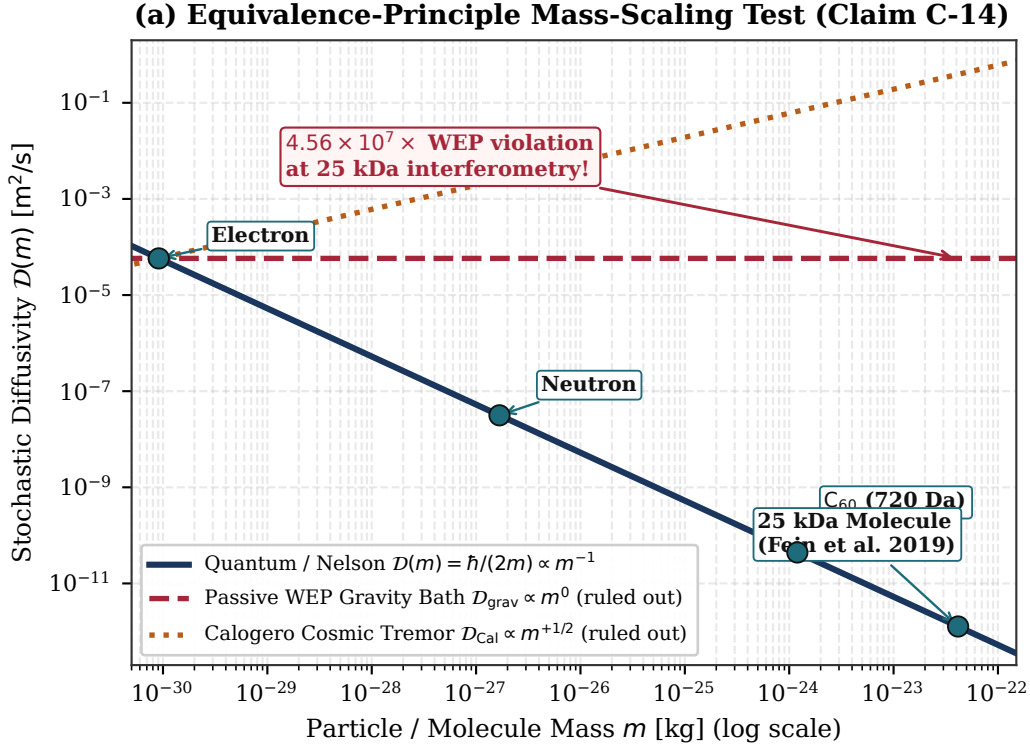
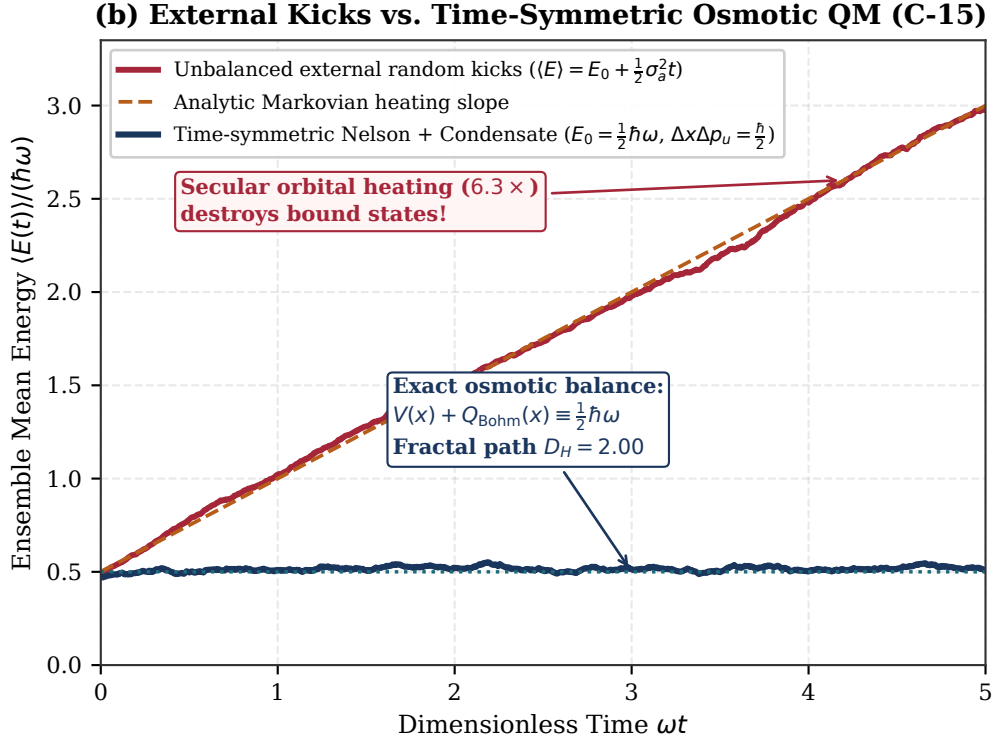

(a) Equivalence-Principle Mass-Scaling Test (Claim C-14)
Stochastic Diffusivity $D(m)$ [m^2/s]
10^{-1}
10^{-3}
10^{-5}
10^{-7}
10^{-9}
10^{-11}
$4.56 \times 10^7 \times$ WEP violation at 25 kDa interferometry!
Electron
Neutron
C_{60} (720 Da)
25 kDa Molecule (Fein et al. 2019)
Quantum / Nelson $D(m) = \hbar/(2m) \propto m^{-1}$
Passive WEP Gravity Bath $D_{\text{grav}} \propto m^0$ (ruled out)
Calogero Cosmic Tremor $D_{\text{Cal}} \propto m^{+1/2}$ (ruled out)
10^{-30} 10^{-29} 10^{-28} 10^{-27} 10^{-26} 10^{-25} 10^{-24} 10^{-23} 10^{-22}
Particle / Molecule Mass m [kg] (log scale)


(b) External Kicks vs. Time-Symmetric Osmotic QM (C-15)
Unbalanced external random kicks ($\langle E \rangle = E_0 + \frac{1}{2}\sigma_a^2 t$)
Analytic Markovian heating slope
Time-symmetric Nelson + Condensate ($E_0 = \frac{1}{2}\hbar\omega$, $\Delta x \Delta p_u = \frac{\hbar}{2}$)
Secular orbital heating ($6.3\times$) destroys bound states!
Exact osmotic balance:
$V(x) + Q_{\text{Bohm}}(x) \equiv \frac{1}{2}\hbar\omega$
Fractal path $D_H = 2.00$
Ensemble Mean Energy $\langle E(t) \rangle / (\hbar\omega)$
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 1 2 3 4 5
Dimensionless Time ωt