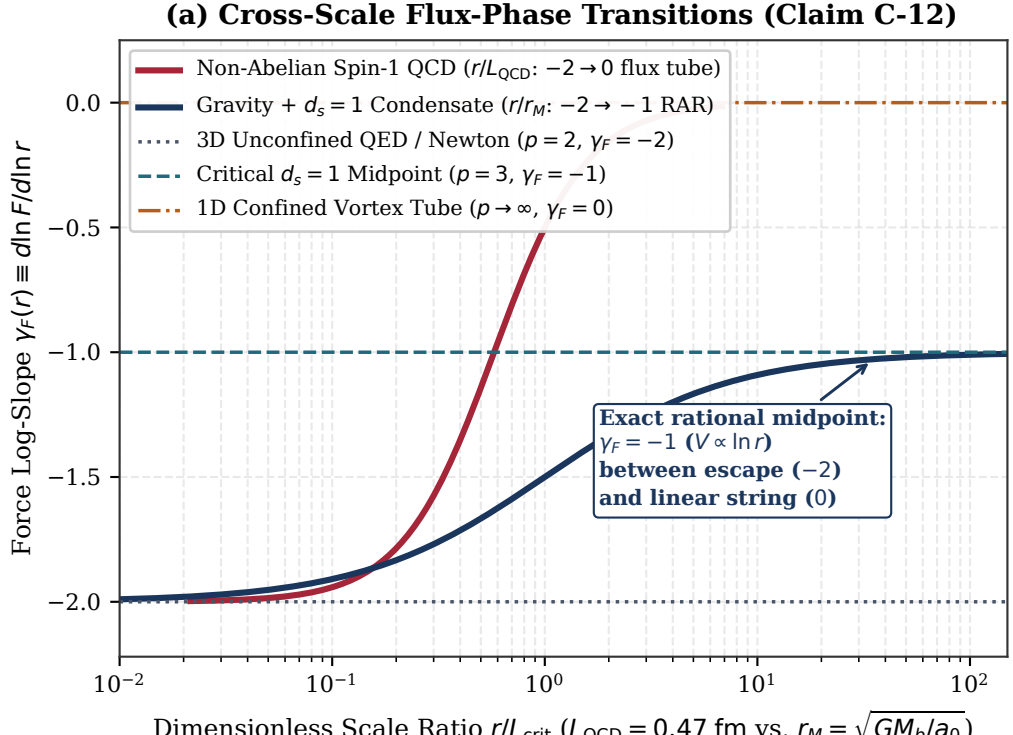
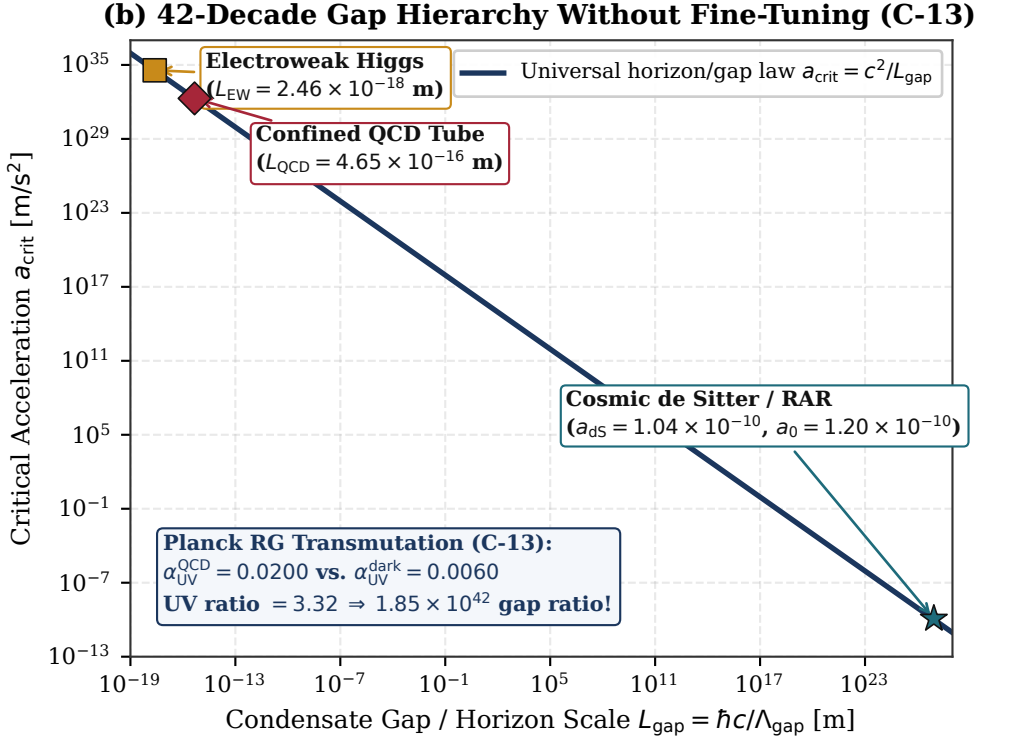

(a) Cross-Scale Flux-Phase Transitions (Claim C-12)
Non-Abelian Spin-1 QCD (r/L_{QCD}: $-2 \to 0$ flux tube)
Gravity + $d_s = 1$ Condensate (r/r_M: $-2 \to -1$ RAR)
3D Unconfined QED / Newton ($p = 2$, $\gamma_F = -2$)
Critical $d_s = 1$ Midpoint ($p = 3$, $\gamma_F = -1$)
1D Confined Vortex Tube ($p \to \infty$, $\gamma_F = 0$)
Exact rational midpoint:
$\gamma_F = -1$ ($V \propto \ln r$)
between escape (-2)
and linear string (0)
Force Log-Slope $\gamma_F(r) \equiv d\ln F/d\ln r$
Dimensionless Scale Ratio r/L_{crit} ($L_{QCD} = 0.47$ fm vs. $r_M = \sqrt{GM_b/a_0}$)


(b) 42-Decade Gap Hierarchy Without Fine-Tuning (C-13)
Electroweak Higgs
($L_{EW} = 2.46 \times 10^{-18}$ m)
Confined QCD Tube
($L_{QCD} = 4.65 \times 10^{-16}$ m)
Universal horizon/gap law $a_{crit} = c^2/L_{gap}$
Cosmic de Sitter / RAR
($a_{dS} = 1.04 \times 10^{-10}$, $a_0 = 1.20 \times 10^{-10}$)
Planck RG Transmutation (C-13):
$\alpha_{UV}^{QCD} = 0.0200$ vs. $\alpha_{UV}^{dark} = 0.0060$
UV ratio $= 3.32 \Rightarrow 1.85 \times 10^{42}$ gap ratio!
Critical Acceleration a_{crit} [m/s^2]
Condensate Gap / Horizon Scale $L_{gap} = \hbar c/\Lambda_{gap}$ [m]