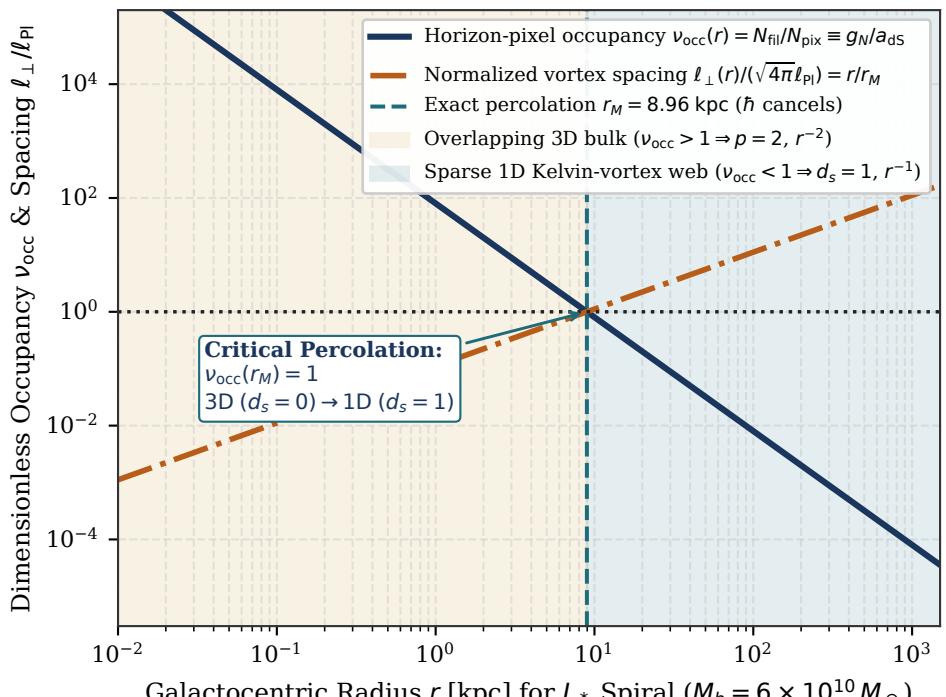
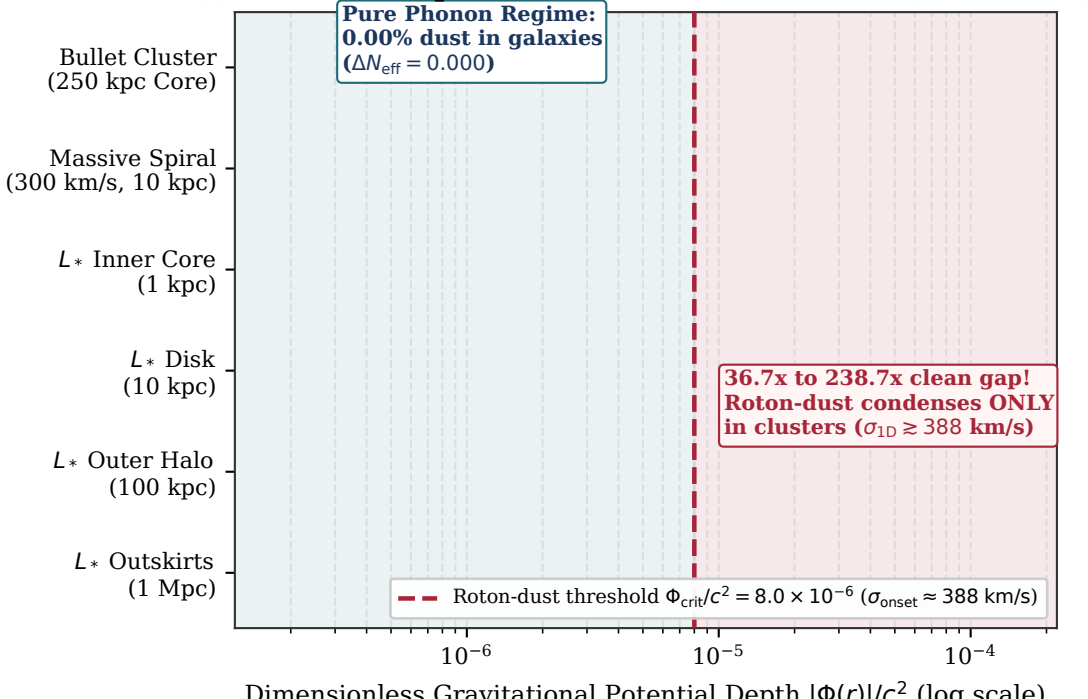

(a) Horizon-Pixel Vortex Percolation into $d_s = 1$ (C-18)
Horizon-pixel occupancy $\nu_{occ}(r) = N_{fil}/N_{pix} \equiv g_N/a_{dS}$
Normalized vortex spacing $\ell_\perp(r)/(\sqrt{4\pi}\ell_{Pl}) = r/r_M$
Exact percolation $r_M = 8.96$ kpc ($\hbar$ cancels)
Overlapping 3D bulk ($\nu_{occ} > 1 \Rightarrow p = 2$, r^{-2})
Sparse 1D Kelvin-vortex web ($\nu_{occ} < 1 \Rightarrow d_s = 1$, r^{-1})
Critical Percolation:
$\nu_{occ}(r_M) = 1$
3D ($d_s = 0$) → 1D ($d_s = 1$)
Dimensionless Occupancy ν_{occ} & Spacing $\ell_\perp/\ell_{Pl}$
10^4
10^2
10^0
10^{-2}
10^{-4}
10^{-2}
10^{-1}
10^0
10^1
10^2
10^3
Galactocentric Radius r [kpc] for L_* Spiral ($M_b = 6 \times 10^{10}\, M_\odot$)


(b) Potential-Depth Resolution of C-04 & C-11 (Claim C-19)
Pure Phonon Regime:
0.00% dust in galaxies
($\Delta N_{eff} = 0.000$)
Bullet Cluster
(250 kpc Core)
Massive Spiral
(300 km/s, 10 kpc)
L_* Inner Core
(1 kpc)
L_* Disk
(10 kpc)
L_* Outer Halo
(100 kpc)
L_* Outskirts
(1 Mpc)
36.7x to 238.7x clean gap!
Roton-dust condenses ONLY
in clusters ($\sigma_{1D} \gtrsim 388$ km/s)
Roton-dust threshold $\Phi_{crit}/c^2 = 8.0 \times 10^{-6}$ ($\sigma_{onset} \approx 388$ km/s)
10^{-6}
10^{-5}
10^{-4}
Dimensionless Gravitational Potential Depth $|\Phi(r)|/c^2$ (log scale)