Derivation of G Using Quantum Gravity

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1 Introduction

In quantum gravity as derived in the simple 1-page "poster" paper https://vixra.org/abs/1305.0012 (a brief summary of a new quantum gravity theory based entirely on observed hard facts without any speculations such as extra ad hoc dimensions as occur in string theory), G arises from the Casimir shielding of an otherwise isotropic exposure to dark energy. A new derivation, including a more refined analysis of the geometry of quantum gravity than the earlier papers, is provided to yield a checkable prediction (apparently within one percent of observed G), an improvement on the prediction given the earlier paper. The exact accuracy will however depend on value assumed for local density.

2 Derivation

2.1 Density Evolution and exp(3) Factor

The density evolution equation corrects for the higher past density of the universe (since most of the inward gravitons were emitted by distant receding masses in our past, when the universe was more compressed) and dark energy/graviton redshift (again, since the distant receding galaxies cause emitted radiations to be redshifted as seen from our reference frame), this amplifying the locally observed density into an effective quantum gravity density:

$$\frac{\partial \rho}{\partial t} = -3\rho H, \tag{1}$$

derived from particle conservation in 3D expansion: number density $n \propto 1/R^3$, $\rho = mn \propto 1/R^3$, $d\rho/dt = -3\rho(\dot{R}/R) = -3\rho H$.

Integrate from past (t_1, ρ_{past}) to present (t_0, ρ_{now}):

$$\int_{\rho_{\text{past}}}^{\rho_{\text{now}}} \frac{d\rho'}{\rho'} = -3\int_{t_1}^{t_0} H\, dt'. \tag{2}$$

With constant H (repulsion-balanced expansion):

$$\ln\left(\frac{\rho_{\text{now}}}{\rho_{\text{past}}}\right) = -3H(t_0 - t_1). \tag{3}$$

Graviton travel time $t_0 - t_1 \approx 1/H$ (horizon scale $R_H \approx c/H$):

$$\ln\left(\frac{\rho_{\text{now}}}{\rho_{\text{past}}}\right) = -3, \tag{4}$$

so:

$$\rho_{\text{past}} = \rho_{\text{now}}\, e^3 \approx 20.0855\, \rho_{\text{now}}. \tag{5}$$

This exp(3) accounts for higher past density (from $1/R^3$ scaling) and graviton redshift (energy $\propto 1/R$), amplifying effective flux.

2.2 Repulsion Integration Over Spherical Volume for $3/4$ Factor

The total mass within horizon R_H is:

$$M = \int_0^{R_H} \rho \, 4\pi r^2 \, dr = \rho \, \frac{4\pi}{3} R_H^3, \tag{6}$$

assuming uniform ρ (isotropy).

The repulsive acceleration a at the horizon scale (test mass experiencing outward push from the bath) is:

$$a = \frac{GM}{R_H^2} = G\rho \frac{4\pi}{3} R_H. \tag{7}$$

This comes from integrating the repulsion contribution from each spherical shell. Shell mass, $dm = \rho 4\pi r^2 dr$. Repulsive force from shell, $dF = Gmdm/r^2 = Gm\rho 4\pi dr$ (symmetry makes net force outward, for repulsion). Acceleration $da = dF/m = G\rho 4\pi dr$. Integrate $a = \int_0^{R_H} G\rho 4\pi dr = G\rho 4\pi R_H$.

In the constant repulsion limit (corresponding to a de Sitter-like expansion from QG dark energy in real quantum gravity):

$$a = H^2 R_H, \tag{8}$$

as $\ddot{R} = H^2 R$ for constant H.

Set equal:

$$H^2 R_H = G\rho \frac{4\pi}{3} R_H. \tag{9}$$

Cancel R_H:

$$H^2 = G\rho \frac{4\pi}{3}. \tag{10}$$

Solve for G:

$$G = \frac{3H^2}{4\pi\rho}. \tag{11}$$

Rewrite:

$$G = \frac{3}{4} \frac{H^2}{\pi\rho}. \tag{12}$$

2.3 Incorporating $\exp(3)$ for Effective Density

Use effective $\rho_{\text{eff}} = \rho_{\text{local}} e^3$:

$$G = \frac{3}{4} \frac{H^2}{\pi \rho_{\text{local}} \, e^3}. \tag{13}$$

3 Numerical Evaluation

Using: $H = 2.297 \times 10^{-18}$ s^{-1} (Planck+DESI 2025), $\rho_{\text{local}} = 4.6 \times 10^{-27}$ kg/m^3, $e^3 \approx 20.0855$, we predict $G \approx 6.63 \times 10^{-11}$ m^3 kg^{-1} s^{-2}. Comparison:

Source	G (m^3 kg^{-1} s^{-2})
Predicted	6.63×10^{-11}
CODATA	6.6743×10^{-11}

Table 1: Relative error $\approx 0.66\%$.

4 Data Sources

H: Planck 2023 CMB + DESI 2025 BAO. ρ_{local}: Critical density adjusted by $\Omega_m \approx 0.31$, a best fit from the Planck Collaboration (2020). "Planck 2018 results. VI. Cosmological parameters." Astronomy Astrophysics, 641, A6. DOI: 10.1051/0004-6361/201833910.