Laboratory G, the Mercury Address $(1/a)^2$, and the Register Ratio $G_{31} = 31^2/144$

Boris V. Kochenov
UKF Core Dev Group
kochenovforwork@gmail.com

August 2026

Abstract

Three numbers are compared: the laboratory value of Newton's gravitational constant G, the orbital quantity $(1/a_{\mathrm{Merc}})^2$ formed from Mercury's semimajor axis, and the geometric register ratio $G_{31} = 31^2/144$. The relative difference between the Mercury address and the register ratio is 8.55×10^{-6} ($-0.000855\,\%$). When the register ratio is scaled by 10^{-11}, all three quantities occupy the same numerical range as conventional determinations of G. The correspondence is recorded as a geometric fact inside the UKF address language. No causal derivation of G from the Mercury orbit is claimed.

1 Laboratory G

Recent torsion-balance work at NIST (Schlamminger et al., published online 16 April 2026) reports

$$G_{\mathrm{lab}} = (6.67387 \pm 0.00038) \times 10^{-11}\,\mathrm{m^3\,kg^{-1}\,s^{-2}}. \tag{1}$$

The CODATA 2022 recommended value is

$$G_{\mathrm{CODATA}} = 6.67430 \times 10^{-11}\,\mathrm{m^3\,kg^{-1}\,s^{-2}}. \tag{2}$$

2 Mercury address

With the semimajor axis $a_{\mathrm{Merc}} = 0.38709843$ AU (JPL/DE-style mean),

$$\left(\frac{1}{a_{\mathrm{Merc}}}\right)^2 = 6.6735540\ldots \tag{3}$$

3 Register ratio

From the integer pair $\{31, 144\}$,

$$G_{31} = \frac{31^2}{144} = \frac{961}{144} = 6.6736111\ldots \tag{4}$$

4 Comparison

The relative difference between the two geometric quantities is

$$\frac{(1/a_{\mathrm{Merc}})^2 - G_{31}}{G_{31}} = -8.55 \times 10^{-6} \quad (-0.000855\,\%). \tag{5}$$

Table 1 collects the four numbers. The first two rows are dimensionless; the last two are laboratory values in SI units. Deviations of the laboratory entries are quoted relative to $G_{31} \times 10^{-11}$.

Quantity	Value	Deviation from G_{31}
Mercury address $(1/a_{\mathrm{Merc}})^2$	6.6735540	$-0.000855\,\%$
Register ratio G_{31}	6.6736111	—
NIST laboratory G (16 Apr 2026)	6.67387×10^{-11}	$+0.0039\,\%$
CODATA 2022 G	6.67430×10^{-11}	$+0.0103\,\%$

Table 1: Geometric addresses and laboratory determinations of G. Laboratory deviations are relative to $G_{31} \times 10^{-11}$.

5 Chronology and statement

The ratio $G_{31} = 31^2/144$ is fixed by the integer register and was not adjusted to Mercury. The comparison with $(1/a_{\mathrm{Merc}})^2$ was made after both numbers already existed independently.

The near-coincidence of the Mercury address and the register ratio at the level of $0.00085\,\%$, together with their proximity to the laboratory scale of G, is recorded as a numerical fact within the UKF framework. Causal identification with Newton's gravitational constant is not asserted.

References

1. S. Schlamminger et al., Redetermination of the gravitational constant with the BIPM torsion balance at NIST, *Metrologia* (2026), DOI:10.1088/1681-7575/ae570f.

2. E. Tiesinga et al., CODATA recommended values of the fundamental physical constants: 2022, *Rev. Mod. Phys.* (CODATA 2022 release).

Related Works

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5. A Kinematic-Geometric Description of Orbital Dynamics, Relativistic Perihelion Precession, and Solar Light Deflection. 10.5281/zenodo.21970258

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