Planck Length From Z Without any Knowledge off G, $\hbar$ or c

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Abstract

It has for more than hundred years been assumed one need to know the Newton gravitational constant G plus the Planck constant $\hbar$ and the speed of light c to find the Planck length. Here we remarkably demonstrate that the Planck length can be found without any knowledge of G, $\hbar$ or c by only observing the change in frequency of a laser beam at two altitudes.

This is a preliminary draft for early release of this discovery, a paper with much more explanation we hope to get time to write soon.

Key Words: Planck length, Planck units, gravity, quantum gravity.

1 The Planck Units

That there existed some fundamental units goes at least back to Stoney [1] that in 1883 suggested that there existed some fundamental natural units that he derived also from elementary charge together with the speed of light and the gravitational constants. These are known today as the Stoney units. It is fair to say the Stoney units where overtaken by the Planck units that Max Planck [2, 3] introduced in 1899 and 1906.

2 Measuring the Planck length without relaying on knowledge of any constant

Haug [4] has recently shown that one can extract the speed of light from gravity observations only

$$\begin{aligned}
z &= \frac{\sqrt{1-\frac{2g_1}{R_1c^2}}}{\sqrt{1-\frac{2g_2}{R_2c^2}}}-1 \\
z &\approx \frac{1-\frac{1}{2}\frac{g_1}{R_1c^2}}{1-\frac{1}{2}\frac{g_2}{R_2c^2}}-1 \\
z &\approx \frac{1-\frac{g_hr_h}{c^2}}{1-\frac{g_LR_L}{c^2}}-1 \\
c &\approx \sqrt{\frac{g_LR_L+g_LR_Lz-g_hR_h}{z}} \qquad (1)
\end{aligned}$$

where z is the gravitational red-shift. Or the exact solution

$$c=\frac{\sqrt{g_LR_LZ^2+2g_LR_LZ+g_LR_L-2g_hR_h}}{\sqrt{Z^2+2Z}} \qquad (2)$$

Further we have

$$
\begin{aligned}
l_p &= \frac{R_L}{c}\sqrt{g_L\bar{\lambda}} \\
l_p &= \frac{R_L}{\frac{\sqrt{g_LR_LZ^2+2g_LR_LZ+g_LR_L-2g_hR_h}}{\sqrt{Z^2+2Z}}}\sqrt{g_L\bar{\lambda}_E} \\
l_p &= \frac{R_L\sqrt{Z^2+2Z}}{\sqrt{g_LR_LZ^2+2g_LR_LZ+g_LR_L-2g_hR_h}}\sqrt{g_L\bar{\lambda}_E} \\
l_p &= \frac{R_L\sqrt{(Z^2+2Z)\bar{\lambda}_E}}{\sqrt{R_LZ^2+2R_LZ+R_L-2\frac{g_h}{g_L}R_h}} \\
l_p &= \frac{R_L\sqrt{(Z^2+2Z)\bar{\lambda}_E}}{\sqrt{R_LZ^2+2R_LZ+R_L-2\frac{R_L^2}{R_h^2}R_h}} \\
l_p &= \frac{\sqrt{(Z^2+2Z)\bar{\lambda}_ER_L}}{\sqrt{Z^2+2Z+1-2\frac{R_L}{R_h}}} \qquad (3)
\end{aligned}
$$

That is the Planck length can be found from simply measure the frequency of a laser beam at two altitudes as this give z and the Compton wavelength of the Earth. For how to find the Compton wavelength of the Earth with no knowledge og G or $\hbar$ see [5, 6]. We can also approximate this

$$
\begin{aligned}
l_p &= \frac{R_L}{c}\sqrt{g_L\bar{\lambda}} \\
l_p &\approx \frac{R_L}{\sqrt{\frac{g_LR_L+g_LR_Lz-g_hR_h}{z}}}\sqrt{g_L\bar{\lambda}_E} \\
l_p &\approx \frac{R_L\sqrt{\bar{\lambda}_Ez}}{\sqrt{R_L+R_Lz-R_h\frac{g_h}{g_L}}} \\
l_p &\approx \frac{R_L\sqrt{\bar{\lambda}_Ez}}{\sqrt{R_L+R_Lz-R_h\frac{R_L^2}{R_h^2}}} \\
l_p &\approx \frac{R_L\sqrt{\bar{\lambda}_Ez}}{\sqrt{R_L+R_Lz-\frac{R_L^2}{R_h}}} \\
l_p &\approx \frac{\sqrt{\bar{\lambda}_Ez}}{\sqrt{\frac{1}{R_L}+\frac{1}{R_L}z-\frac{1}{R_h}}} \\
l_p &\approx \frac{\sqrt{R_L\bar{\lambda}_Ez}}{\sqrt{1+z-\frac{R_L}{R_h}}} \qquad (4)
\end{aligned}
$$

This means we remarkable can measure the Planck length only by observing the change in wavelength in a gravitational field and the Compton wave of the gravitational object. This means we can measure Planck length without any knowledge of G, $\hbar$ or c. This in strong contrast to the assumptions in standard physics where it is assumed one only can derive the Planck units from G, c and $\hbar$. This support Haug's claim that the Newton gravitational constant G (that Newton never invented nor used) is a composite constant of the form $G = \frac{l_p^2c^3}{\hbar}$. It is still a universal constant, but it is a composite of the more fundamental constants, that is the Planck length, the speed of light and the Planck constant, see [7]. See also [8]

References

[1] J. G. Stoney. On the physical units of nature. *The Scientific Proceedings of the Royal Dublin Society*, 3, 1883.

Planck Length	Prediction	Easily applicable in practice?
From redshift	$l_p = \frac{\sqrt{R_L \bar{\lambda}_E (Z^2+2Z)}}{\sqrt{2+Z^2+2Z-\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From redshift Weak field approximation	$l_p \approx \frac{\sqrt{R_L \bar{\lambda}_E z}}{\sqrt{1+z-\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From redshift	$l_p = \frac{\sqrt{R_L(\lambda_h^2-\lambda_L^2)\bar{\lambda}_E}}{\sqrt{2\lambda_h^2-2\lambda_L^2\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From redshift Weak field approximation	$l_p \approx \frac{\sqrt{(\lambda_h-\lambda_L)\bar{\lambda}_E R_L}}{\sqrt{\lambda_h-\lambda_L\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From time dilation	$l_p = \frac{\sqrt{R_L \lambda_E (T_h^2-T_L^2)}}{\sqrt{2T_h^2-2T_L^2\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From time dilation	$l_p \approx \frac{\sqrt{R_L \lambda_E (T_h-T_L)}}{\sqrt{T_h-T_L\frac{R_L}{R_h}}}$	No need G, c or $\hbar$
From gravitational light bending	$l_p = \frac{\sqrt{\delta \bar{\lambda} R}}{2}$	No need G or $\hbar$, Need to know c
From gravitational, acceleration field	$l_p = \frac{R}{c}\sqrt{g\bar{\lambda}}$	No need G or $\hbar$, Need to know c
From orbital velocity	$l_p = \frac{\sqrt{R\bar{\lambda}}}{c} v_o$	No need G or $\hbar$, Need to know c
From escape velocity	$l_p = \frac{\sqrt{R\bar{\lambda}}}{c}\frac{v_e}{2}$	No need G or $\hbar$, Need to know c
From From Grandfather Pendulum clock	$l_p = \frac{R}{cf}\sqrt{2\pi L \lambda}$	No need G or $\hbar$, Need to know c
From Newton force spring	$l_p = \frac{R}{c}\sqrt{\frac{kx\lambda}{2\pi m}}$	No need G or $\hbar$, Need to know c

Table 1: Ways to measure (extract) the speed of light/gravity from gravitational observations

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