Using gravitation to emulate electromagnetism

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Abstract

The possibility of universe-scale black holes living in closed 3D space of constant positive curvature was briefly considered in previous work. Further consideration of this possibility is given here. A possible link between gravitation and electromagnetism is discussed.

1 Introduction

Where R_U is the Euclidean 4-radius of a universe that is bound by a closed 3D space of constant positive curvature [1], an equatorial-scale Schwarzschild black hole (e.g., where event horizon area is $A = 4\pi R_U^2$) has a rest energy E_0 of

$$E_0 = E_{\text{eq}} = \frac{E_p R_U}{2\ell_p}. \quad (1)$$

The maximum rest energy of a black hole is

$$E_0 = E_{\max} = 2E_{\text{eq}}. \quad (2)$$

Consider black holes of all scales where $A \neq 0$. The black hole event horizon colatitude $\Phi = (0, \pi)$ is

$$\Phi = \begin{cases} E_0 < E_{\text{eq}}, & \arccos\sqrt{\frac{E_p^2 R_U^2 - 4(E_0^2 \ell_p^2)}{E_p^2 R_U^2}}, \\ E_0 = E_{\text{eq}}, & \frac{1}{2}\pi, \\ E_0 > E_{\text{eq}}, & 1 - \arccos\sqrt{\frac{E_p^2 R_U^2 - 4([2E_{\text{eq}} - E_0]^2 \ell_p^2)}{E_p^2 R_U^2}}, \end{cases} \quad (3)$$

and the black hole event horizon area $A = (0, 4\pi R_U^2]$ is

$$A = 4\pi(R_U^2 - R_U^2 \cos^2\Phi). \quad (4)$$

The black hole's entropy is

$$S = 4\pi \frac{E_0^2}{E_p^2}. \quad (5)$$

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Where $E_0 \leq E_{\rm eq}$, the entropy to area ratio is constant

$$\frac{S}{A} \equiv \frac{1}{4\ell_p^2} \approx 10^{69}. \tag{6}$$

Else, where $2E_{\rm eq} > E_0 > E_{\rm eq}$, the entropy to area ratio is variable[1]

$$\frac{S}{A} = \left(\frac{1}{4\ell_p^2}, \infty\right). \tag{7}$$

The increase in entropy to area ratio is equivalent to an increase in interaction strength[2]

$$G' = \frac{4SG^2\hbar}{Ac^3} = (G, \infty). \tag{8}$$

For instance, by manually setting $G' = G \times 10^{40} \approx 6.67 \times 10^{29}$ in an attempt to emulate the electromagnetic interaction, the result is that $S/A \approx 10^{109}$, and that the corresponding length scale

$$\ell' = \sqrt{\frac{\hbar G'}{c^3}} \tag{9}$$

is $\ell' \approx 10^{-15}$.

Do these results imply that electromagnetically interacting fundamental particles are universe-scale black holes (e.g., $\Phi \approx \pi$, $A \approx 0$, $E_0 \approx 10^{69}$ where $R_U \approx 10^{25}$)? If so, then it can be seen why the Heisenberg uncertainty principle implies that a fundamental particle is everywhere at once. This is because the interior of a fundamental particle (e.g., a universe-scale black hole) would literally envelop everything else. As well, it seems likely that a fundamental particle's large surplus of hidden energy (e.g., $E_0 - 8 \times 10^{-14} \approx E_0$ Joules for an electron) would serve as the source of its "virtual" energy.

Is the concept of universe-scale black holes somehow related to the concept of dimensional compactification (e.g., the winding of energy)?

References

[1] Halayka S. Can the Edges of a Complete Graph Form a Radially Symmetric Field in Closed Space of Constant Positive Curvature? (2010) viXra:1007.0039

[2] Halayka S. Closed space fitness test C++ code v1.1. (2010) `http://code.google.com/p/completegraphcurved/downloads/list`

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[1] The Landau pole can be avoided if $A = 16\pi\ell_p^2 \approx 10^{-68}$ is taken to be the minimum event horizon area for both standard-scale (e.g., $\Phi \approx 0$) and universe-scale (e.g., $\Phi \approx \pi$) black holes.

[2] This concept also applies to standard-scale black holes (e.g., $\Phi \approx 0$). As an external test particle travels radially inward toward the black hole's event horizon, the "horizon" area at the particle's radial distance (e.g., $A_h = 4\pi r^2$) decreases over time while the black hole's entropy remains constant (e.g., barring Hawking radiation and test particle mass-energy). As such, the strength of gravitation increases alongside the entropy to area ratio as the test particle gets closer to the event horizon. At the event horizon of a standard black hole, the entropy to area ratio is equal to $1/(4\ell_p^2)$ (e.g., the escape velocity is equal to c).