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 [1–3], 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

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

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

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

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

$$A = 4\pi(R_U^2 - R_U^2 \cos^2 \Phi). \tag{3}$$

The black hole's entropy is

$$S = 4\pi \frac{E_0^2}{E_p^2}. \tag{4}$$

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

$$\frac{S}{A} \equiv \frac{1}{4\ell_p^2} \approx 10^{69}. \tag{5}$$

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

$$\frac{S}{A} = \left(\frac{1}{4\ell_p^2}, \infty\right). \tag{6}$$

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

$$G' = \frac{4SG^2\hbar}{Ac^3} = (G, \infty). \tag{7}$$

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

$$\ell' = \sqrt{\frac{\hbar G'}{c^3}} \tag{8}$$

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)?[3]

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[1]The concept of 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 relationship between entropy to area ratio and interaction strength 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).

[3]A numerology: No compactification leads to one charge type (e.g., mass), and a characteristic hidden energy per particle of ~ 0. A single compactification (e.g., North-South via the parameter Φ, like discussed in this paper) leads to two charge types (e.g., $-$, $+$), and a hidden energy of $\sim 2E_{\text{eq}}$. A double compactification (e.g., North-South-East-West via the parameter set $\{\Phi_{\text{NS}}^{\text{weak}}, \Phi_{\text{EW}}^{\text{weak}}\}$) leads to four charge types (e.g., manifested by the W^-, W^+, W^0, B^0 particles), and a hidden energy of $\sim 4E_{\text{eq}}$. A triple compactification (e.g., North-South-East-West-Up-Down via $\{\Phi_{\text{NS}}^{\text{strong}}, \Phi_{\text{EW}}^{\text{strong}}, \Phi_{\text{UD}}^{\text{strong}}\}$) leads to six charge types (e.g., RGB, CMY), and a hidden energy of $\sim 6E_{\text{eq}}$. By adding the 1 large time and 3 large spatial dimensions that are required by general relativity to the $(1+2+3=6)$ compactified spatial dimensions that are required by the three Standard Model interactions, one arrives at the familiar 10 spacetime dimensions of Supersymmetric String Theory. However, if universe-scale black holes do indeed exist, then only the 4 spacetime dimensions of general relativity would be actual. The remaining 6 spatial dimensions would be entirely fictitious.

References

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