Errata

A UV complete picture of black hole conforming to low energy effective field theory

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The following corrections are required in order to properly convey the results of the paper.

- On page 1 (sign clarification in Eq. (1)):

..., quantum Einstein gravity should correspond to ...

$$\Phi(r) = -\frac{M}{r} \left[1 + \frac{\zeta \hbar}{r^2} \pm \mathcal{O}\left(\frac{1}{r^3}\right) \pm \dots \right] \quad (1)$$

(as throughout the current paper, we employ geometrized unit system: $c = G = 1$, $\hbar \equiv l_P^2$) where a magnitude-wise, leading order, additive quantum correction (Term $\propto 1/r^3$) to classical Newton potential can be observed to get scaled by ...

- On page 2 (sign clarification):

... we find a Schwarzschild symmetric IR gravity to imply

$$ds^2|_{\text{IR}} = -\left\{ 1 - \frac{r_S}{r} - \frac{\zeta \hbar r_S}{r^3} \mp \mathcal{O}\left(\frac{1}{r^4}\right) \mp \dots \right\} dt^2 \\
+ \left\{ \frac{1}{1 - \frac{r_S}{r} - \frac{\zeta \hbar r_S}{r^3} \mp \mathcal{O}\left(\frac{1}{r^4}\right) \mp \dots} \right\} dr^2 + r^2 d\Omega^2, \quad (3)$$

where $r_S = 2M$, and $d\Omega^2 = d\theta^2 + \sin^2 \theta d\phi^2$ represents the metric of a unit 2-sphere.

- On page 2 (sign clarification):

... quantum gravity fluid having its IR matter distribution being given by

$$\mathcal{M}_{\mathcal{N}}|_{\text{IR}}(r) = M \left[1 + \frac{\zeta \hbar}{r^2} \pm \dots \right] \quad (4)$$

$$= M + \frac{\zeta \hbar M}{r^2} \pm \dots = M + \mathcal{M}_{\text{exotic}} \Big|_{\text{IR}}(r) \quad (5)$$

such that ...

- On page 6 (sign rectification):

... spherically symmetric Kerr–Schild space–time line element, being read as

$$ds^2 = -f(r)dt^2 + \frac{dr^2}{f(r)} + r^2 d\Omega^2, \quad (20)$$

where $d\Omega^2$ corresponds to ...

- On page 12 (sign rectification):

... black hole geometry. This geometry is Kerr–Schild class, being of the form

$$ds^2 = -f_{\mathcal{Q}}(r)dt^2 + \frac{dr^2}{f_{\mathcal{Q}}(r)} + r^2(d\theta^2 + \sin^2\theta d\phi^2) \quad (50)$$

for ...

- On page 13 (typographical rectification):

... where

$$z = \tilde{\gamma} \hbar k^2 (1 - c_1 \tilde{\gamma} \hbar k^2), \quad (62)$$

$$z' = 2\tilde{\gamma} \hbar k k' (1 - 2c_1 \tilde{\gamma} \hbar k^2), \quad (63)$$

$$z'' = 2\tilde{\gamma} \hbar k'^2 (1 - 6c_1 \tilde{\gamma} \hbar k^2) + 2\tilde{\gamma} \hbar k k'' (1 - 2c_1 \tilde{\gamma} \hbar k^2). \quad (64)$$

Here “prime” sign represents differentiation

- On page 14 (typographical rectification):

... we find following characteristic quantum gravity fields at certain regimes:

$$G_t^t = G_r^r \approx + \frac{3\gamma \hbar r_S^2}{r^6}, \quad \sqrt[3]{\hbar r_S} \ll r < r_S; \quad (66)$$

$$\approx - \frac{6r^3}{\hbar^2 \gamma^2 c_1 r_S}, \quad r \ll \sqrt[3]{\hbar r_S}. \quad (67)$$

- On page 15 (typographical rectification):

and

$$G_\theta^\theta = G_\phi^\phi \approx - \frac{6\gamma \hbar r_S^2}{r^6}, \quad \sqrt[3]{\hbar r_S} \ll r < r_S; \quad (68)$$

$$\approx - \frac{12r^3}{\hbar^2 \gamma^2 c_1 r_S}, \quad r \ll \sqrt[3]{\hbar r_S}. \quad (69)$$

- On page 15 (in Sec. 6; a typographical rectification):
... the UV regime of space-time, viz. $r \ll \sqrt[3]{\hbar r_S}$ where $f_Q(r) \simeq 1 - \mu r^5$; elsewhere ...
- On page 18:
... we may forward following safe constraint on c_1 :

$$0.3 \lesssim c_1 \lesssim 2. \quad (82)$$

- On page 24 (in Sec. 9; a typographical rectification):
... defined by the classical space-time geometry and

$$z(r) = (1 - c_1 \tilde{\gamma} \hbar k^2(r)) \tilde{\gamma} \hbar k^2(r)$$

represents the function manifesting quantum gravitational effect