

Erratum: Can black holes evaporate past extremality? [Phys. Rev. D **113**, 064012 (2026)]

Samuel E. Gralla  Received 7 August 2026; published 7 October 2026)DOI: [10.1103/y959-6g4w](https://doi.org/10.1103/y959-6g4w)

The paper incorrectly reported physical thin-shell solutions that form timelike singularities. These solutions are spurious. The error arose when an equation was squared in moving from Eqs. (13), (14), and (27) to Eq. (28),

$$\sqrt{1 + \dot{R}^2} = \frac{m^2 - Q^2 + 2MR}{2mR}. \quad (28)$$

This equation is necessary but not sufficient. The needed extra condition follows from Eqs. (14) and (37), which separately give s as

$$\text{sign}(f\dot{V} - \dot{R}) = s = \text{sign}(R - r_b),$$

together with $\dot{V} > 0$ to ensure a future-directed shell motion. This condition was not enforced in the parameter-space analysis of Sec. III, leading to spurious solutions.

In particular, Table I gives only the radial ranges implied by Eq. (28) and is therefore incomplete as a statement of physical shell motion. In every $f > 0$ region these ranges must additionally be supplemented by $R > r_b$. Thus the entry “All ok” in subextremal case II means only that Eq. (28) imposes no restriction for $R > 0$; points with $f > 0$ and $R < r_b$ are unphysical. For bound shells ($m > M$), physical initial data in an $f > 0$ region require

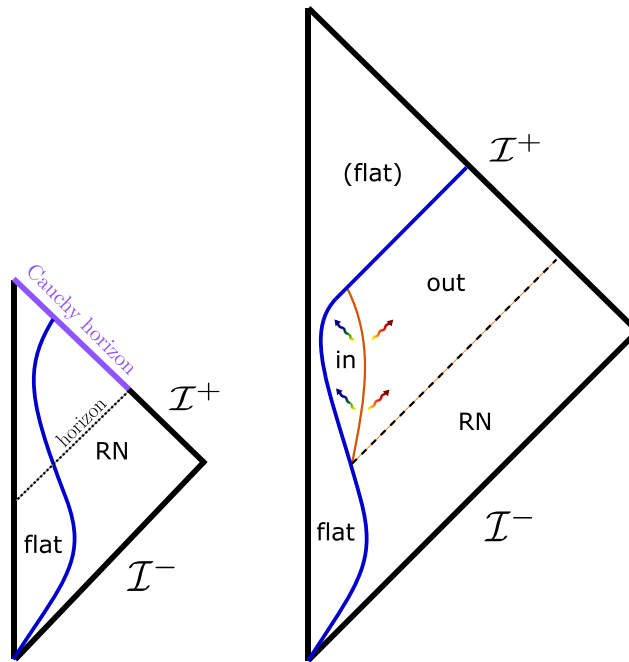


FIG. 1. Penrose diagrams for charged spherical collapse, with and without backreaction. The shell trajectory is shown as a blue line. In Einstein-Maxwell theory (no backreaction, left panel), both an event horizon and a Cauchy horizon are formed. Neither horizon forms in the Vaidya model of backreaction (right panel); the shell becomes null and escapes to infinity after evaporation past extremality.

$$r_b < R \leq r_0,$$

which is possible only if

$$r_b < r_0 \Leftrightarrow m^2 + Q^2 - 2mM < 0.$$

Consequently, the purported subextremal collapse sector and all of superextremal case III are unphysical.

The regions labeled “Collapse” in Fig. 4 are therefore unphysical, as are the examples of timelike and naked singularity formation given in Sec. III. The red singular trajectory in Fig. 1, the left panel of Fig. 2, and all associated statements about timelike or naked singularities should be disregarded. Outcome (i) in the abstract is absent; only outcome (ii) remains. The analysis of the physical bounce and branch solutions in Sec. IV is unchanged, so the main conclusion that the matter becomes an outgoing null shell during evaporation is unaffected.

A combined, updated version of these Figs. 1 and 2 is given here as Fig. 1.

There is also an independent overall-sign error in Eq. (41), which should read

$$F_\tau = \frac{\dot{V}^2}{4\pi R^2} \left[M'(V) - \frac{Q(V)}{R} Q'(V) \right].$$

This is a typographical error and does not propagate into subsequent equations.

I thank Christoph Kehle for pointing out the error concerning the singular solutions.