Erratum: Particle Accelerators Inside Spinning Black Holes [Phys. Rev. Lett. 104, 211102 (2010)]

Kayll Lake

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The divergence claimed in [1] does not exist. It is not that the formulas given are in error, but rather there is an error in my interpretation. I only sketch the argument here. Consider the Penrose—Carter diagram for the Kerr metric off the axis of rotation [2] and consider the two branches of r_- to the past of the first bifurcation two-sphere to the future of the event horizon. To reach the Cauchy horizon of the right-hand universe there must exist a turning point $\dot{t} = 0$ along the geodesic sent in from the right-hand universe. It turns out that there can be at most one such turning point and l must satisfy $A < l < 4/A$. For two particles in this range that hit r_-, $N_- = 0$ and it follows that there is no divergence. For particles to hit the other branch of r_-, l must lie outside the stated range and for these $N_- = 0$ and it follows that there is no divergence. To obtain $N_- \neq 0$, and therefore a divergence, one must take particles one from each range. But then these particles do not collide. The considerations in [1] do not exhaust all of the possibilities—there are particles which fall from rest at infinity in the left-hand universe. But these have energy $= -1$ (not 1). Reworking the formulas for these one eventually arrives back at the purpose of this erratum: $N_- \neq 0$ only for particles that actually do not collide. N_- is of course an invariant, but its representation can be confused by a bad choice of coordinates. The issue here can, once again, be traced to our old enemy, "t".

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[1] K. Lake, Phys. Rev. Lett. **104**, 211102 (2010).

[2] See, for example J. B. Griffiths and J. Podolský *Exact Space-Times in Einstein's General Relativity* (Cambridge University Press, Cambridge, 2009); B. O'Neill *The Geometry of Kerr Black Holes* (A K Peters, Wellesley, 1995).

