Erratum: Near-horizon extreme Kerr magnetospheres [Phys. Rev. D **93**, 024035 (2016)]

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After the publication of Ref. [1], we noted three algebraic mistakes in Eqs. (97), (101), and (107) in Sec. V. C. In Eq. (97), the right-hand side is $\approx r^{2-2h}$. Then, Eq. (99) should read $\text{Re}(h) \geq 1$. In Eqs. (101) and (107), the right-hand side is $\approx \lambda^{2-2h}$. We also noted that the finiteness of angular momentum ought to be addressed in order to derive the strongest bounds on the weights of the solutions. After analysis, Eq. (101) should be replaced by

$$\dot{\mathcal{E}}_{\text{out}} - \Omega_{\text{ext}} \dot{\mathcal{J}}_{\text{out}} \approx \lambda^{2-2h} \dot{\mathcal{E}}, \quad \dot{\mathcal{J}}_{\text{out}} \approx \lambda^{1-2h} \dot{\mathcal{J}}. \quad (1)$$

This leads to another outcome following the analysis of admissible weights, described in Appendix B of Ref. [1], which invalidates Eqs. (102) and (103).

The solutions which admit a finite energy and angular momentum flux in the asymptotically flat region obey $\text{Re}(h) \geq \frac{1}{2}$. If $\text{Re}(h) > 1$, finiteness of the energy fixes $\dot{\mathcal{E}} = 0$, and the near-horizon solution brings no information about the asymptotically flat solution. We will therefore discard such solutions. If $\text{Re}(h) > \frac{1}{2}$, finiteness of the angular momentum fixes $\dot{\mathcal{J}} = 0$, but energy can still flow at or close to the superradiant bound. The final bound that replaces (103) is therefore $\frac{1}{2} \leq \text{Re}(h) \leq 1$ and $\dot{\mathcal{J}} = 0$ for $\text{Re}(h) > \frac{1}{2}$.

Real solution (137) was described only for real $h \geq \frac{1}{2}$, but real solutions with arbitrary complex h are also admissible. Therefore, Eq. (137) should be replaced by

$$A^M = \int dh \sum_{q \in \mathbb{Z}} \Phi^h \lambda^q \left[X_5 \mu^2 - \frac{iq\gamma(1 - k^2\gamma^2)}{q^2 - \Delta(h, q)\gamma^2} X'_5 \mu^3 \right] + \text{c.c.} \quad (2)$$

According to the corrected bound on weights, the list of potentially physical solutions in Sec. VI. C is incorrect and needs to be adapted. Instead of Eqs. (146) and (147), one has solution (2) of this Erratum with $h = \frac{1}{2} + i\eta$, $\eta \in \mathbb{R}$; solution (137) with $h = 1$; solution (138) with $\mu = \pm kq$; solution (142) with $\frac{1}{2} \leq \text{Re}(h) \leq 1$; solution (143) with $h = 1$; solution (144); and finally solution (145). All such solutions have finite energy and angular momentum fluxes with respect to the asymptotically flat observer. However, they are all singular at the future Poincaré horizon except the positive branch of solution (145). This null solution was originally found in Ref. [2].

[1] S. E. Gralla, A. Lupsasca, and A. Strominger, [arXiv:1602.01833](https://arxiv.org/abs/1602.01833).

[2] A. Lupsasca and M. J. Rodriguez, *J. High Energy Phys.* **07** (2015) 090.