Erratum: Force on a point charge source of the classical electromagnetic field [Phys. Rev. D **100**, 065012 (2019)]

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While the main results reported in the original paper remain intact, a computational blunder has affected the results of the example studied in Sec. VII of that paper; also there, in the second and third lines below (88), the references to rhs (63) and to rhs (64) must be swapped. The blunder occurred in the calculation of the contribution of the first line at rhs (63) to the $O(\kappa^2)$ radiation-reaction force on a charged point particle that moves along a constant applied electric field. It caused, in the second line of (87), the incorrect expression

$$-\frac{1}{2}e^2\kappa^2 \int_0^t \frac{\mathbf{a}(t')}{|\mathbf{v}(t')|^2} \left[\frac{6 - \frac{1}{c}|\mathbf{v}(t')| - 3\frac{|\mathbf{v}(t')|^2}{c^2}}{1 - \frac{|\mathbf{v}(t')|^2}{c^2}} - \left(3\frac{c}{|\mathbf{v}(t')|} - \frac{1}{2} \right) \ln \frac{1 + \frac{1}{c}|\mathbf{v}(t')|}{1 - \frac{1}{c}|\mathbf{v}(t')|} \right] c dt', \quad (1)$$

whereas the correct expression is

$$-e^2\kappa^2 \int_0^t \frac{\mathbf{a}(t')}{|\mathbf{v}(t')|^2} \left[\frac{2 - \frac{|\mathbf{v}(t')|^2}{c^2}}{1 - \frac{|\mathbf{v}(t')|^2}{c^2}} - \frac{c}{|\mathbf{v}(t')|} \ln \frac{1 + \frac{1}{c}|\mathbf{v}(t')|}{1 - \frac{1}{c}|\mathbf{v}(t')|} \right] c dt'. \quad (2)$$

This is the true contribution from the first line at rhs (63) in the original paper. Using that for straight-line motion $\mathbf{v}(t)$ and $\mathbf{a}(t)$ are parallel, and $\mathbf{a}(t) = \dot{\mathbf{v}}(t)$, one can carry out the time integration in the above expression (2) and obtain

$$\frac{1}{2}e^2\kappa^2 \frac{\mathbf{v}(t)}{|\mathbf{v}(t)|} \left[2\frac{c}{|\mathbf{v}(t)|} - \frac{c^2}{|\mathbf{v}(t)|^2} \ln \frac{1 + \frac{1}{c}|\mathbf{v}(t)|}{1 - \frac{1}{c}|\mathbf{v}(t)|} \right]. \quad (3)$$

Remarkably, this cancels the expression in the first line at rhs (87), i.e. the contribution from the first line at rhs (64) in the original paper. Thus rhs (88) changes into $\kappa^2\mathbf{0} + O(\kappa^3)$, and so

$$\mathbf{f}_1^{\text{em}}(t) = O(\kappa^3). \quad (4)$$

Explicitly, in this example the radiation-reaction force expanded to $O(\kappa^2)$ *vanishes identically*.

Therefore, those conclusions in the original paper which were derived from the incorrect (87), (88) should be discarded.

In a follow-up investigation of the motion of a charged point particle along a constant applied electric field, by the author and Carley [1], we have found (among other things) that the radiation-reaction force at $O(\kappa^3)$ does not vanish identically, and that it acts against the applied external force, as expected from a radiation-reaction force. The details will appear in [1].

Two typos are as follows: at rhs (56) a $\frac{1}{c}$ is missing in front of $\mathbf{v}(t)$, and $-\kappa^3$ in the last line of rhs (63) should be $+\kappa^3$.

The author thanks Holly Carley for checking all computations to $O(\kappa^2)$ and $O(\kappa^3)$, and for discussions.

- [1] H. K. Carley and M. K.-H. Kiessling, A study of the radiation-reaction on a point charge which moves along a constant applied electric field in an electromagnetic Bopp-Landé-Thomas-Podolsky vacuum (to be published).